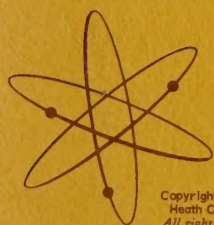


PRICE \$2.00

HEATH COMPANY • BENTON HARBOR, MICHIGAN

HEATHKIT® ASSEMBLY MANUAL



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AM CLOCK RADIO MODEL GR-38

595-1101
10-31-69

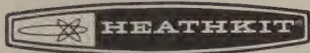
TYPICAL COMPONENT TYPES

This chart is a guide to commonly used types of electronic components. The symbols and related illustrations

should prove helpful in identifying most parts and reading the schematic diagrams.

RESISTOR	CAPACITOR	TUBE
POTENTIOMETER (CONTROL)	ELECTROLYTIC CAPACITOR	TRANSISTOR
TRANSFORMER (IRON CORE)	VARIABLE CAPACITOR	RECTIFIER (DIODE)
TRANSFORMER (ADJUSTABLE POWDERED IRON CORE) ARROW INDICATES DIRECTION OF CORE MOVEMENT TO INCREASE INDUCTANCE	BATTERY	NEON BULB
TRANSFORMER (ADJUSTABLE CORE)	PHONO JACK	ILLUMINATING BULB
POWER TRANSFORMER	PHONE JACK	METER
INDUCTOR (COIL)	RECEPTACLE	SPST SWITCH (TOGGLE) DPDT
PIEZOELECTRIC CRYSTAL	SPEAKER	SWITCH (ROTARY)
BINDING POST	MICROPHONE	FUSE
ANTENNA GENERAL LOOP	EARTH GROUND CHASSIS GROUND	CONDUCTORS NOT CONNECTED CONNECTED SHIELDED

Assembly and Operation of the



AM CLOCK RADIO

MODEL GR-38

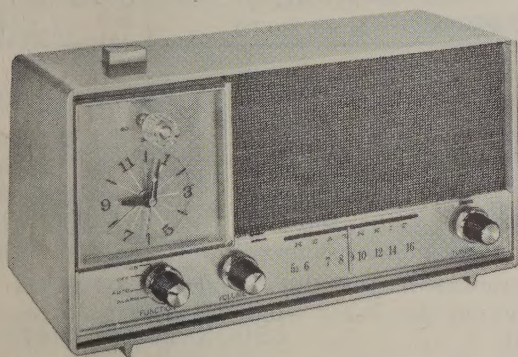


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INTRODUCTION

The Heathkit Model GR-38 Clock Radio provides you with a versatile household servant that performs all the functions of an AM radio, clock, alarm, and timer. The AM radio places your favorite news, sports, and music programs right at your fingertips. The clock-timer is useful in the kitchen, bedroom, and all through the house, turning on breakfast in the morning, waking you gently, or turning on lights in the evening when you are away from home. The Lull-To-Sleep switch will turn off the Radio automatically (and a lamp if one is plugged into the AC outlet on the rear of the Radio) up to 60 minutes after you set it.

The delayed alarm wakes you up gently by turning on the Radio and the AC outlet (and the coffee pot if it is plugged into the AC outlet). The alarm turns on ten minutes later. Push the Snooze switch and the alarm turns off but leaves the Radio and the AC outlet on. After ten minutes, the alarm will sound again.

Only a few simple adjustments are needed, and these adjustments can be completed without instruments. Low heat, freedom from hum, long life, and virtually service-free operation are also assured by the all-transistor construction.

The Radio's trim, modern, plastic case looks good in any location. Included with your Radio is a factory-prepared speaker grille and a special grille mounting gasket. This gasket enables you to make a custom Radio grille to match a fabric in your home. The clock dial is illuminated with a warm glow that makes it easy to read at night. This attractive Clock Radio is sure to become a most useful and pleasing helper that will give you many years of good service.

Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

PARTS LIST

To order replacement parts, refer to the Replacement Parts Price List and use the Parts Order Form furnished with this kit.

The numbers in parentheses are keyed to the numbers on the Parts Pictorial (fold-out from Page 5).

PART No.	PARTS Per Kit	DESCRIPTION
-------------	------------------	-------------

RESISTORS

NOTE: Some of the resistors listed below will have a 10% (silver fourth band) tolerance and the others will have a 5% (gold fourth band) tolerance. The difference is not important to the assembly of the kit, and it will not be called out in the assembly steps.

(1)1-143	✓ 2	2.7 Ω (red-violet-gold)
1-54	✓ 1	15 Ω (brown-green-black)
1-111	✓ 3	150 Ω (brown-green-brown)

PART No.	PARTS Per Kit	DESCRIPTION
-------------	------------------	-------------

Resistors (cont'd.)

1-45	✓ 1	220 Ω (red-red-brown)
1-9	✓ 3	1000 Ω (brown-black-red)
1-144	✓ 2	1800 Ω (brown-gray-red)
1-13	✓ 3	2700 Ω (red-violet-red)
1-16	✓ 3	4700 Ω (yellow-violet-red)
1-20	✓ 1	10 kΩ (brown-black-orange)
1-22	✓ 1	22 kΩ (red-red-orange)
1-76	✓ 3	33 kΩ (orange-orange-orange)
1-121	✓ 3	120 kΩ (brown-red-yellow)
1-77	✓ 1	390 kΩ (orange-white-yellow)

PART No.	PARTS Per Kit	DESCRIPTION
-------------	------------------	-------------

CAPACITORS

Electrolytic

(2)25-123	✓ 1	2 μ F
25-54	✓ 1	10 μ F, 15V
25-95	✓ 1	10 μ F, 25V
25-145	✓ 1	25 μ F
25-146	✓ 1	100 μ F
25-199	✓ 1	500 μ F

Others

(3)21-111	✓ 1	15 pF disc
21-57	✓ 2	.005 μ F disc
21-47	✓ 1	.01 μ F disc
(4)26-128	1	Variable tuning capacitor
(5)27-63	✓ 7	.022 μ F Mylar*
27-73	✓ 2	.047 μ F Mylar
(6)28-3	✓ 1	.56 pF phenolic (green-blue-gray-silver)

CONTROL-MOTOR

(7)19-139	✓ 1	10 k Ω control
(8)406-54	1	Clock motor assembly

COILS-TRANSFORMERS

(9)40-676	✓ 1	Oscillator coil
52-90	✓ 1	IF transformer
(10)40-930	✓ 1	Rod antenna
(11)52-89	✓ 1	IF transformer
(12)54-219	1	Power transformer

TRANSISTORS-DIODES

NOTE: Transistors are marked for identification in one of the following four ways:

1. Heath part number.
2. Transistor type number.
3. Heath part number and transistor type number.
4. Heath part number with a transistor type number other than the one listed.

(13)417-110	1 ✓	S2090 transistor
417-116	1 ✓	S2091 transistor
(14)417-118	4 ✓	2N3393 transistor
417-201	1 ✓	X29A829 transistor
(15)56-26	1 ✓	1N191 diode (brown-white-brown)
57-29	2 ✓	Silicon diode

PART No.	PARTS Per Kit	DESCRIPTION
-------------	------------------	-------------

HARDWARE

#6 Hardware

(16)250-56	4	6-32 x 1/4" screw
(17)250-416	4	6-32 x 1/4" flat head screw
(18)250-89	7	6-32 x 3/8" screw
(19)250-276	4	6-32 x 3/8" flat head screw
(20)250-441	2	#6 x 3/8" flat head sheet metal screw
(21)250-8	2	#6 x 3/8" sheet metal screw
(22)250-308	2	6-32 x 1" flat head screw
(23)252-3	14	6-32 nut (1 extra)
(24)252-127	4	6-32 speednut
(25)254-6	34	#6 external lockwasher (2 extra)
(26)255-103	5	6-32 threaded spacer

Other Hardware

(27)252-7	2	Control nut
(28)253-10	1	Control flat washer
(29)253-11	2	E washer
(30)254-4	2	Control lockwasher
(31)255-102	2	Unthreaded spacer
(32)258-111	1	Dial cord spring

SHAFT-KNOBS-POINTER

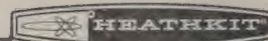
(33)453-179	✓ 1	Dial shaft
(34)462-291	1	Tuning knob
(35)462-294	1	Function knob
462-309	1	Volume knob
(36)462-295	1	Lull-To-Sleep knob
(37)462-297	1	Clock-set knob
(38)462-310	1	Snooze knob
(39)463-50	1	Radio dial pointer
463-55	✓ 1	Set of clock hands

Consisting of:

(40)	1	Alarm hand
(41)	1	Hour hand
(42)	1	Minute hand
(43)	1	Second hand

METAL PARTS

(44)200-536	1	Chassis
(45)100-974	1	Speaker panel
(46)203-580	1	Clock panel
(47)204-915	✓ 2	Short U bracket
(48)204-933	✓ 2	L bracket
(49)204-1011	2	Long U bracket



PART No.	PARTS Per Kit	DESCRIPTION
----------	---------------	-------------

TERMINAL STRIPS-CONNECTORS-SOCKET

(50) 431-78	✓ 1	3-lug terminal strip
(51) 431-79	✓ 1	4-lug terminal strip
(52) 432-66	7	Connector
(53) 434-147	✓ 1	AC socket

WIRE-LINE CORD

344-2	1 ✓	Black stranded wire
344-3	1 ✓	Red stranded wire
344-6	1 ✓	Red solid wire
344-32	1 ✓	Green stranded wire
89-19	1	Line cord

DIAL PARTS

(54) 203-572	1	Clock window
(55) 446-73	1	Dial window
(56) 390-243	1	Light reflector
(57) 390-265	1	Dial label
(58) 390-266	1	Clock label
(59) 100-818	✓ 1	Pulley bracket assembly
(60) 455-9	✓ 1	Long bushing

PART No.	PARTS Per Kit	DESCRIPTION
----------	---------------	-------------

Dial Parts (cont'd.)

455-38	1	Short bushing
100-889	✓ 1	Dial cord assembly

MISCELLANEOUS

85-314-1	1	Circuit board
92-54	1	Cabinet
401-129	1	Speaker
(61) 412-15	✓ 1	Neon lamp
(62) 94-436	1	9-3/4" molding
(63) 94-437	1	3" molding
(64) 73-53	✓ 1	Grommet
(65) 75-30	✓ 1	Line cord strain relief
75-93	1	1" x 1" paper light shield
(66) 209-61	1	Speaker grille
(67) 207-4	✓ 1	Cable clamp
73-74	1	Grille gasket
(68) 490-1	1	Alignment tool
(69) 490-5	1	Nut starter
391-34	1	Blue and white label
597-308	1	Kit Builders Guide
597-260	1	Parts order form
		Manual (See front cover for part number.)
		Solder

STEP-BY-STEP ASSEMBLY

Before starting to assemble this kit, read the Kit Builders Guide for complete information on wiring, soldering, and step-by-step assembly procedures.

CIRCUIT BOARD ASSEMBLY

Install components on the circuit board by following the steps on Pictorials 1 through 4. Only part of the circuit board is shown in

Pictorial 4; the small identification drawing at the top of this Pictorial shows which area of the circuit board to work on.

Resistors will be called out by their resistance value (in Ω or $k\Omega$) and color code.

Capacitors will be called out by the capacitance value (in pF or μF), type (ceramic, Mylar, electrolytic, or phenolic), and color code.

START



FOR GOOD SOLDERED CONNECTIONS, YOU MUST KEEP THE SOLDERING IRON TIP CLEAN...



WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.

Position the circuit board as shown. Then complete each of the following steps.

(✓) 1000 Ω (brown-black-red).

(✓) 2700 Ω (red-violet-red).

(✓) 1800 Ω (brown-gray-red).

(✓) 220 Ω (red-red-brown).

(✓) 2.7 Ω (red-violet-gold).

(✓) 150 Ω (brown-green-brown).

(✓) 2.7 Ω (red-violet-gold).

(✓) 22 k Ω (red-red-orange).

(✓) 390 k Ω (orange-white-yellow).

(✓) 4700 Ω (yellow-violet-red).

() Solder the leads to the foil and cut off the excess lead lengths.

(✓) 120 k Ω (brown-red-yellow).

(✓) 10 k Ω (brown-black-orange).

(✓) 4700 Ω (yellow-violet-red).

(✓) 33 k Ω (orange-orange-orange).

(✓) 1000 Ω (brown-black-red).

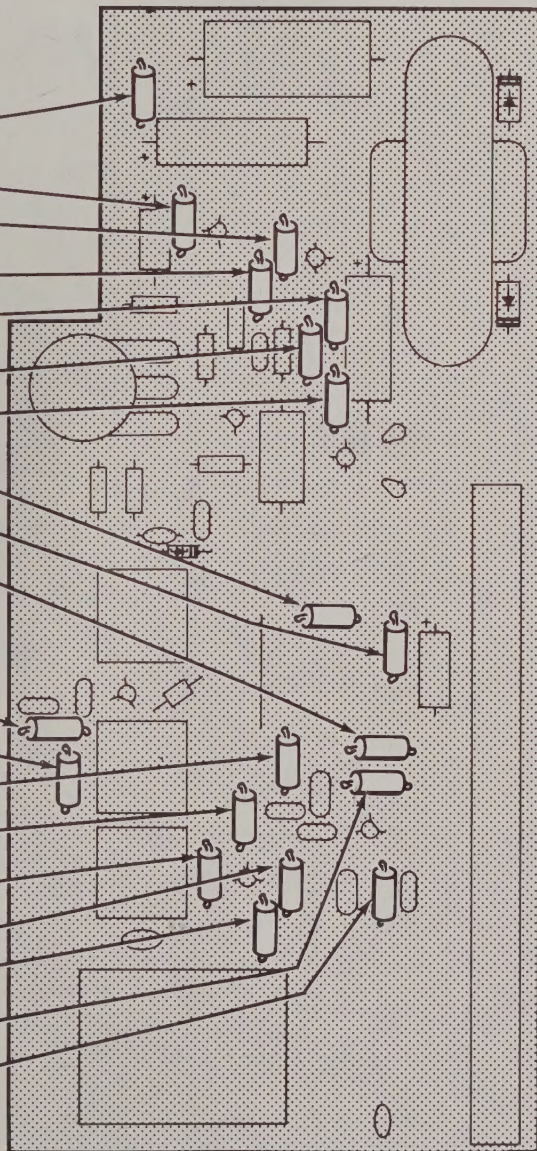
(✓) 33 k Ω (orange-orange-orange).

(✓) 2700 Ω (red-violet-red).

(✓) 150 Ω (brown-green-brown).

(✓) 150 Ω (brown-green-brown).

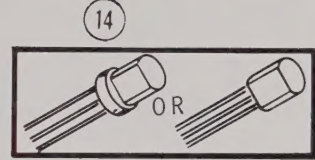
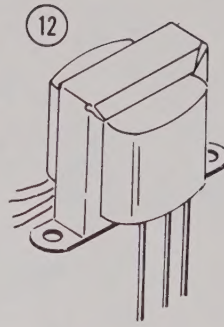
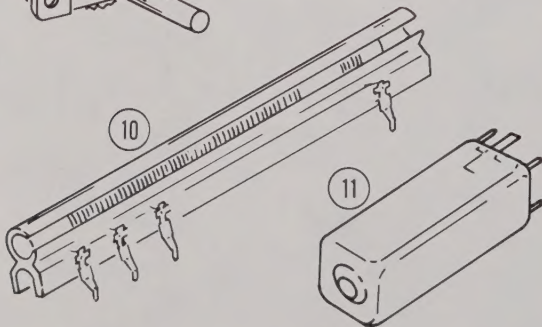
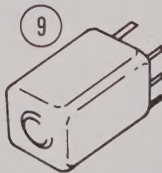
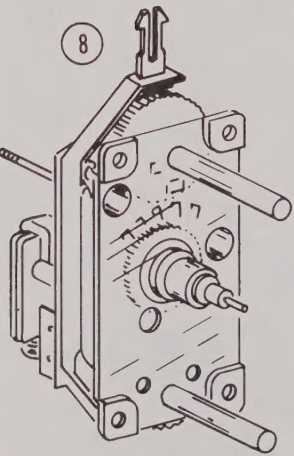
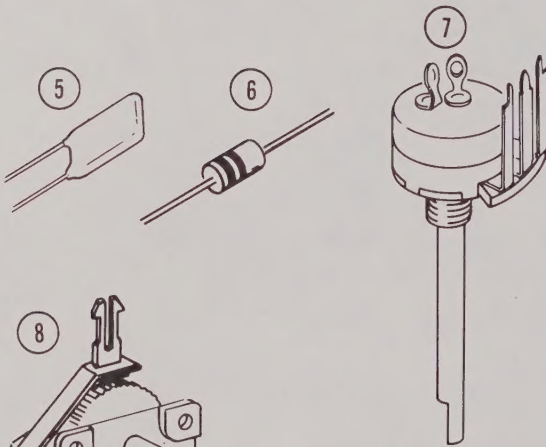
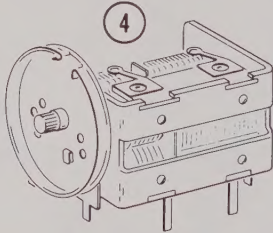
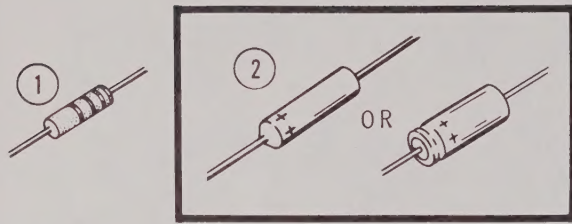
() Solder the leads to the foil and cut off the excess lead lengths.



PROCEED TO PICTORIAL 2.

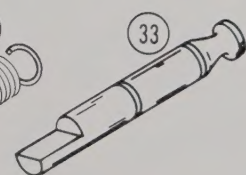
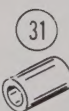
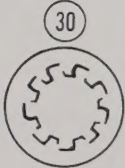
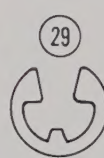
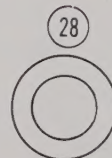
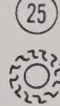
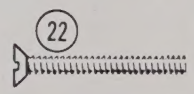
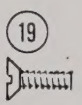
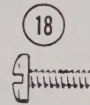
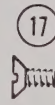
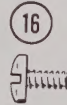
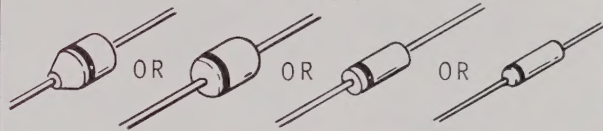
PICTORIAL 1

PARTS P

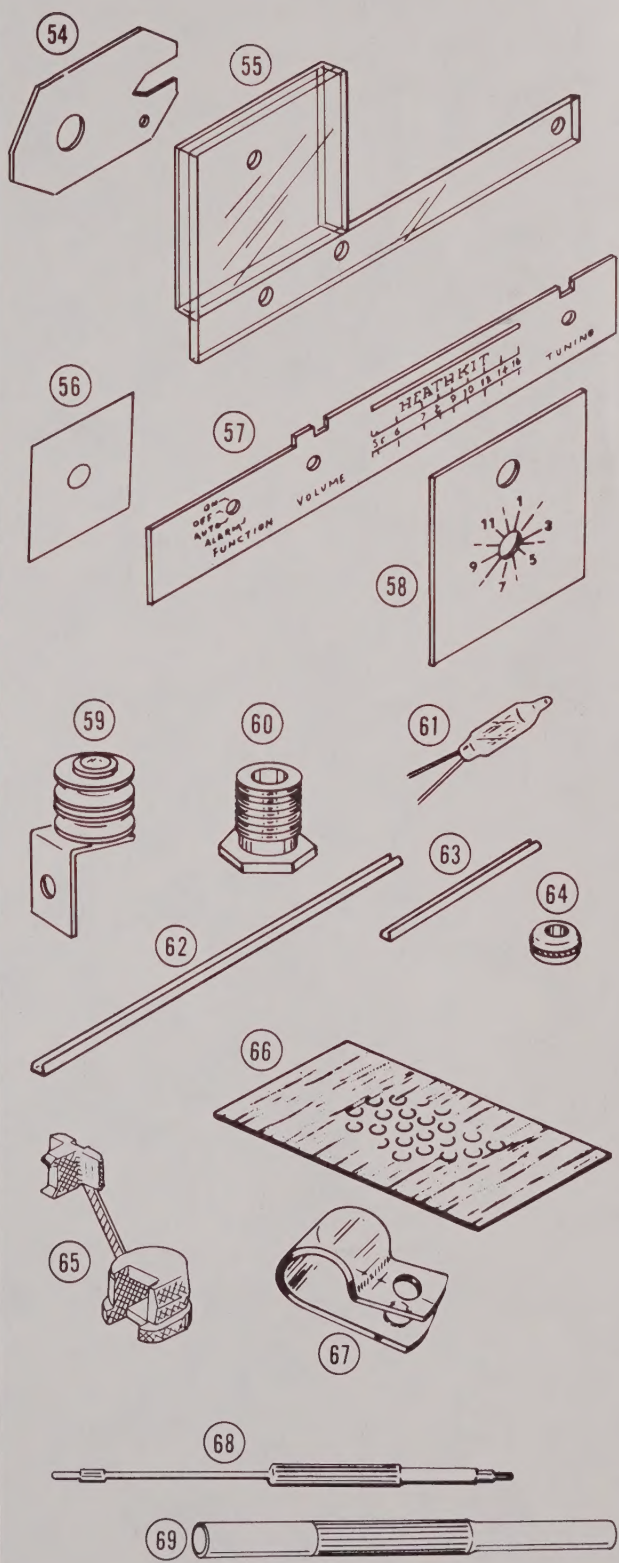
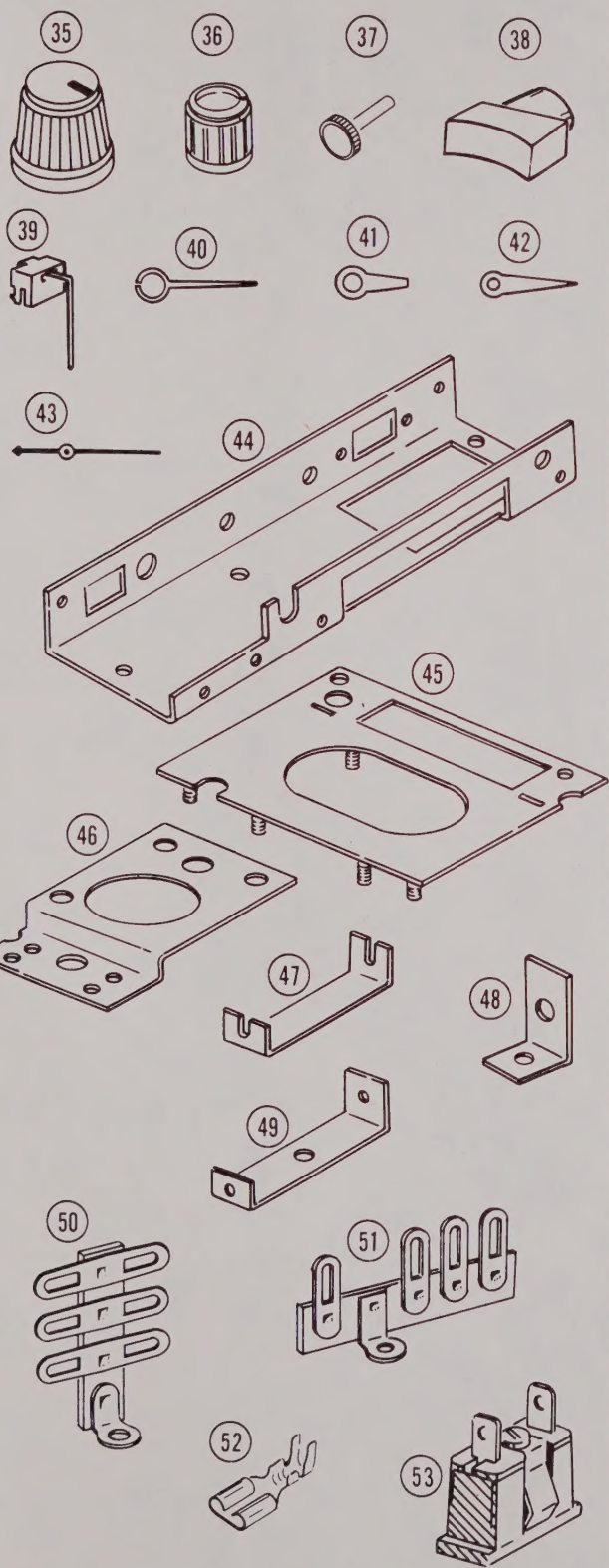


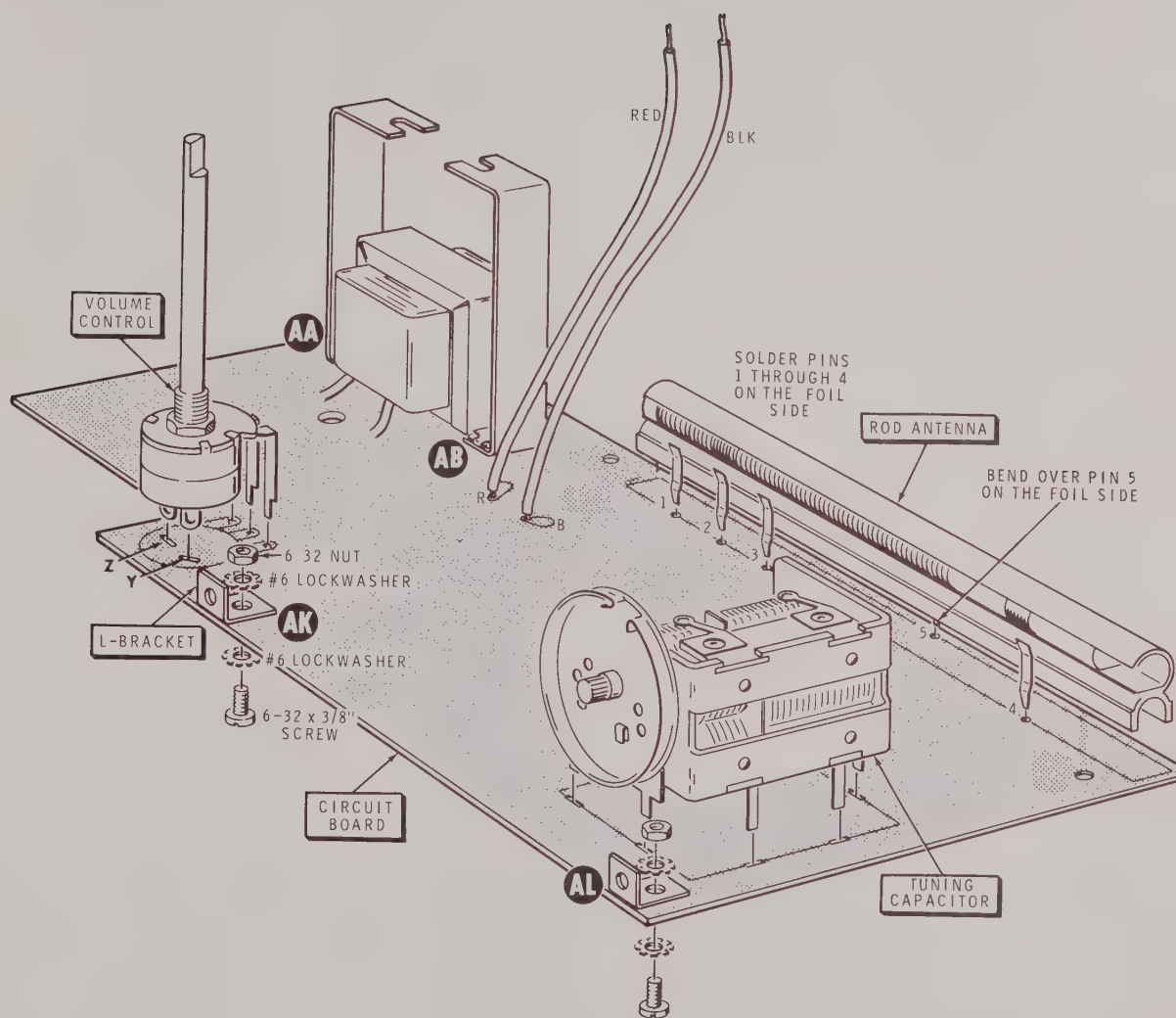
15

NOTE: HEATH PART NUMBERS ARE STAMPED ON MOST DIODES.



TUTORIAL





PICTORIAL 5

START



FOR GOOD SOLDERED CONNECTIONS, YOU MUST KEEP THE SOLDERING IRON TIP CLEAN...



WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.

(✓) 15 Ω (brown-green-black).

(✓) 4700 Ω (yellow-violet-red).

(✓) 120 k Ω (brown-red-yellow).

(✓) 120 k Ω (brown-red-yellow).

(✓) 2700 Ω (red-violet-red).

(✓) 1000 Ω (brown-black-red).

(✓) 1800 Ω (brown-gray-red).

(✓) Solder the leads to the foil and cut off the excess lead lengths.

(✓) .005 μ F disc.

(✓) .022 μ F Mylar.

(✓) .022 μ F Mylar.

(✓) .022 μ F Mylar.

(✓) .022 μ F Mylar.

(✓) .56 pF phenolic (green-blue-gray-silver).

(✓) .047 μ F Mylar.

(✓) .022 μ F Mylar.

(✓) .022 μ F Mylar.

(✓) .01 μ F disc.

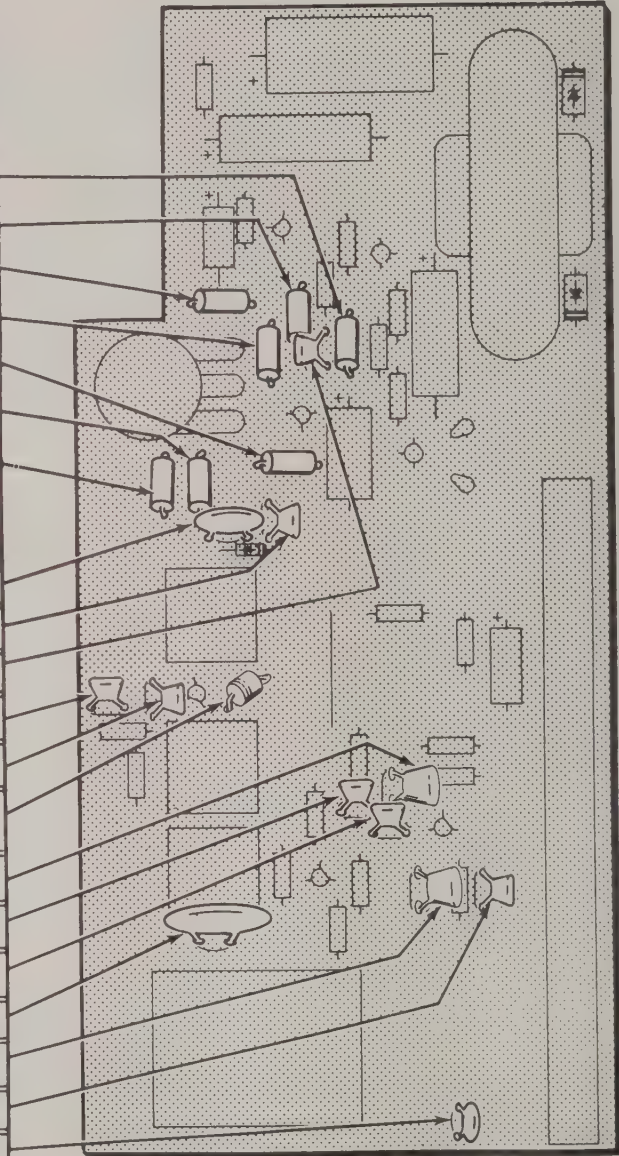
(✓) .047 μ F Mylar.

(✓) .022 μ F Mylar.

(✓) 15 pF disc.

() Solder the leads to the foil and cut off the excess lead lengths.

NOTE: There should now be a 33 k Ω (orange-orange-orange) resistor and a .005 disc capacitor remaining that will be used later.



PICTORIAL 2

PROCEED TO PICTORIAL 3.

START

NOTE: When installing electrolytic capacitors, position the positive (+) lead at the plus (+) mark on the circuit board.

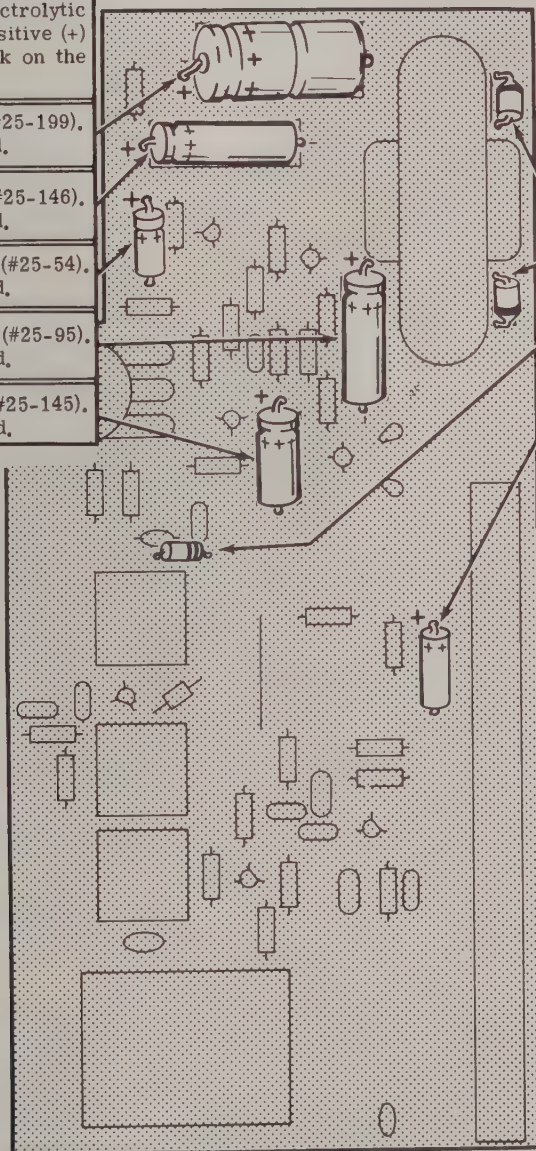
(✓) 500 μ F electrolytic (#25-199).
Note position of (+) end.

(✓) 100 μ F electrolytic (#25-146).
Note position of (+) end.

(✓) 10 μ F 15 V electrolytic (#25-54).
Note position of (+) end.

(✓) 10 μ F 25 V electrolytic (#25-95).
Note position of (+) end.

(✓) 25 μ F electrolytic (#25-145).
Note position of (+) end.



CONTINUE

NOTE: DIODES MAY BE SUPPLIED IN ANY OF THE FOLLOWING SHAPES. THE CATHODE END OF THE DIODE IS MARKED WITH A BAND OR BANDS. ALWAYS POSITION THIS END AS SHOWN IN THE PICTORIAL.



(✓) Silicon diode (#57-29) at D2.
Note position of cathode end.

(✓) Silicon diode (#57-29) at D3.
Note position of cathode end.

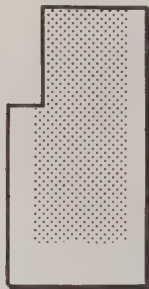
(✓) 1N191 germanium diode (#56-26) (brown-white-brown) at D1.
Note position of cathode end.

(✓) 2 μ F electrolytic (#25-123).
Note position of (+) end.

(✓) Solder all leads to the foil and cut off the excess lead lengths. Save two long cut-off capacitor leads for use in later steps.

PROCEED TO PICTORIAL 4

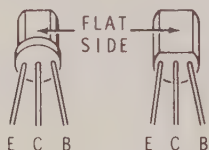
PICTORIAL 3

CONTINUE IDENTIFICATION
DRAWING

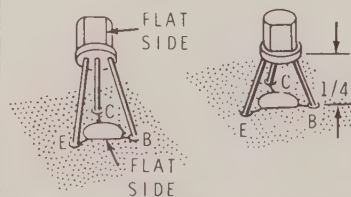
START



NOTE: The transistors used in the next steps may be either one of the two types shown below.



Install the transistors in the following manner. Match the flat side of each transistor with the outline of the flat on the circuit board; then insert the emitter (E), collector (C), and base (B) leads into their proper holes. Position the transistors 1/4" away from the circuit board. Solder each lead to the foil and cut off the excess lead lengths.



(✓) Transistor (#417-201) at Q4.

(✓) 2N3393 transistor (#417-118) at Q5.

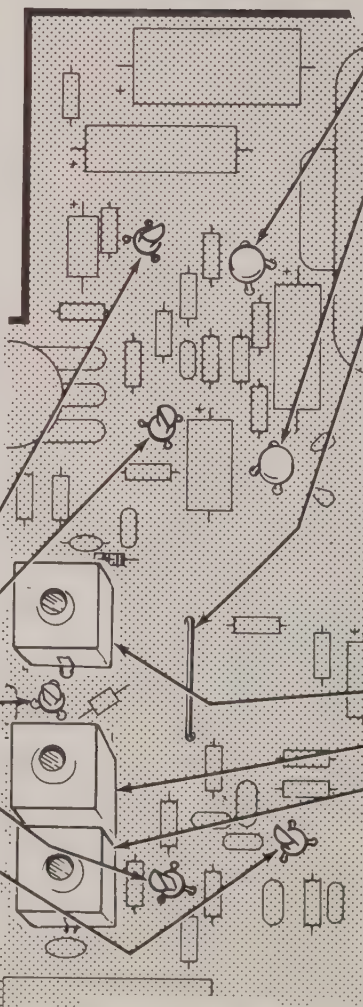
(✓) 2N3393 transistor (#417-118) at Q3.

(✓) 2N3393 transistor (#417-118) at Q2.

(✓) 2N3393 transistor (#417-118) at Q1.

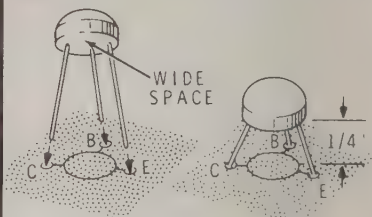
FOR GOOD SOLDERED CONNECTIONS, YOU MUST KEEP THE SOLDERING IRON TIP CLEAN...

WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.



PICTORIAL 4

NOTE: When installing the next two transistors, line up the wide-spaced transistor leads with the wide space on the circuit board. Insert the leads into their correct holes indicated by C, B, and E. Solder each lead to the foil and cut off the excess lead length.

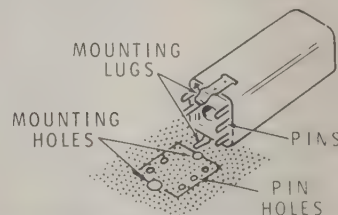


(✓) S2090 transistor (#417-110) at Q6.

(✓) S2091 transistor (#417-116) at Q7.

(✓) Wire (use one of the long capacitor leads that was saved from an earlier step). Solder both ends to the foil and cut off the excess lead lengths.

NOTE: The transformers to be installed in the following steps have irregularly spaced pins. Be sure to align the pins of the transformer so they correspond to the pin holes in the circuit board. Solder the mounting lugs and pins of each transformer as it is installed.



(✓) IF transformer (#52-90).

(✓) IF transformer (#52-89).

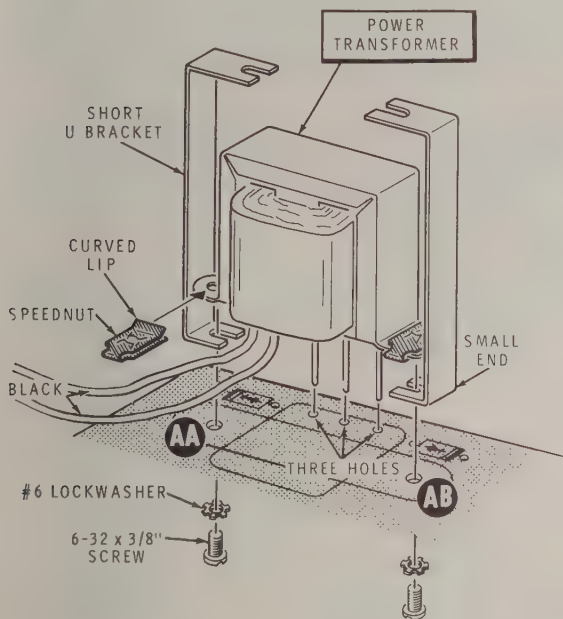
(✓) Oscillator coil (#40-676).

This completes the circuit board assembly. Check the foil side of the circuit board to see if any connections have been missed. Make certain that there are no solder bridges between the foils. Set the circuit board aside until called for later.

Mounting Circuit Board Parts

Refer to Pictorial 5 (fold-out from Page 6) for the following steps.

- (1) Mount the rod antenna to the circuit board. Make sure the pins on the rod antenna are straight. Set the rod antenna on the circuit board in the proper position and gently push the pins through the holes. Bend pin 5 over on the foil side of the circuit board. Then, solder pins 1 through 4 to the foil. Remove the soldering iron from these connections as quickly as possible to avoid loosening the pins in the plastic antenna container.
- (2) Install the L brackets at AK and AL as shown in the Pictorial. Use a 6-32 x 3/8" screw, two #6 lockwashers, and a 6-32 nut on each L bracket. Position the brackets as shown and tighten the screws.



Detail 5A

- (3) Make sure the tuning capacitor plates are fully meshed (closed) to prevent damage to them. Mount the tuning capacitor to the circuit board as shown in the Pictorial. Be sure that all 6 tabs are all the way through the circuit board. Twist the 4 longest mounting tabs 1/8 of a turn to hold the tuning capacitor in place, then solder all 6 tabs to the foil.

Refer to Detail 5A for the following steps.

- (4) Install two speednuts on the power transformer. The curved lip of each speednut should be up.
- (5) Straighten the three bare power transformer leads if necessary.
- (6) Position the power transformer as shown between AA and AB, and pass the three bare transformer leads through the three corresponding holes in the circuit board. Do not solder the leads.
- (7) Start two 6-32 x 3/8" screws, with lockwashers, through holes AA and AB and into the speednuts on the power transformer. Do not tighten these screws.
- (8) Position the two short U brackets as shown at AA and AB. Place the small end of each U bracket between the transformer and the circuit board. Tighten the screws at AA and AB.
- (9) Solder the three bare power transformer leads to the circuit board and cut off the excess lead lengths.
- (10) Position the 10 kΩ control on the circuit board as shown in the Pictorial. Push the pins through the circuit board and twist the lugs at Y and Z 1/8 of a turn. Solder the three control lugs to the foil. NOTE: Lugs Y and Z on the back of the control will not be soldered or used.

Refer to Pictorial 5 (fold-out from Page 6) for the following steps.

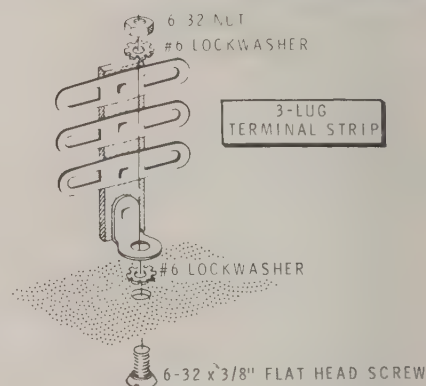
- (✓) Cut an 8" length of black wire and an 8" length of red stranded wire. Remove 1/4" of insulation from the ends of both wires. Twist the small strands together and apply a small amount of solder to each end.
- (✓) Push one end of the prepared black wire through circuit board hole B (S-1). In a like manner, push one end of the prepared red stranded wire through hole R (S-1).

This completes the assembly of the circuit board. Check carefully to see that all connections are soldered properly and that there are no solder bridges between adjacent foils. Cut off any excess lead lengths; then set the circuit board aside until it is called for later.

CHASSIS PARTS MOUNTING

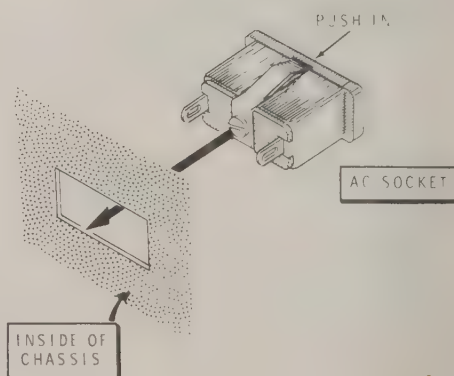
Refer to Pictorial 6 for the following steps.

- (✓) Locate the chassis and mount the pulley bracket assembly and a 6-32 threaded spacer at CC with a 6-32 x 3/8" screw and three #6 lockwashers. Position the assembly straight up as shown. Tighten the screw securely through the access hole in the rear of the chassis.
- (✓) Mount 6-32 threaded spacers at CA, CB, and CD. Use a 6-32 x 1/4" screw and two #6 lockwashers for each spacer. Tighten the screws by inserting the screwdriver through the holes in the rear apron of the chassis.
- (✓) Mount the long bushing at CE with a control lockwasher and a control nut.
- (✓) See inset drawing #1 on Pictorial 6 and, with a pair of pliers, install an E washer in the rear slot in the dial shaft.
- (✓) Lubricate the dial shaft where the shaft fits into the bushing. CAUTION: Do not lubricate the narrow neck at the back of the shaft where the dial cord will be strung. Light machine oil or petroleum jelly will work well for this purpose.

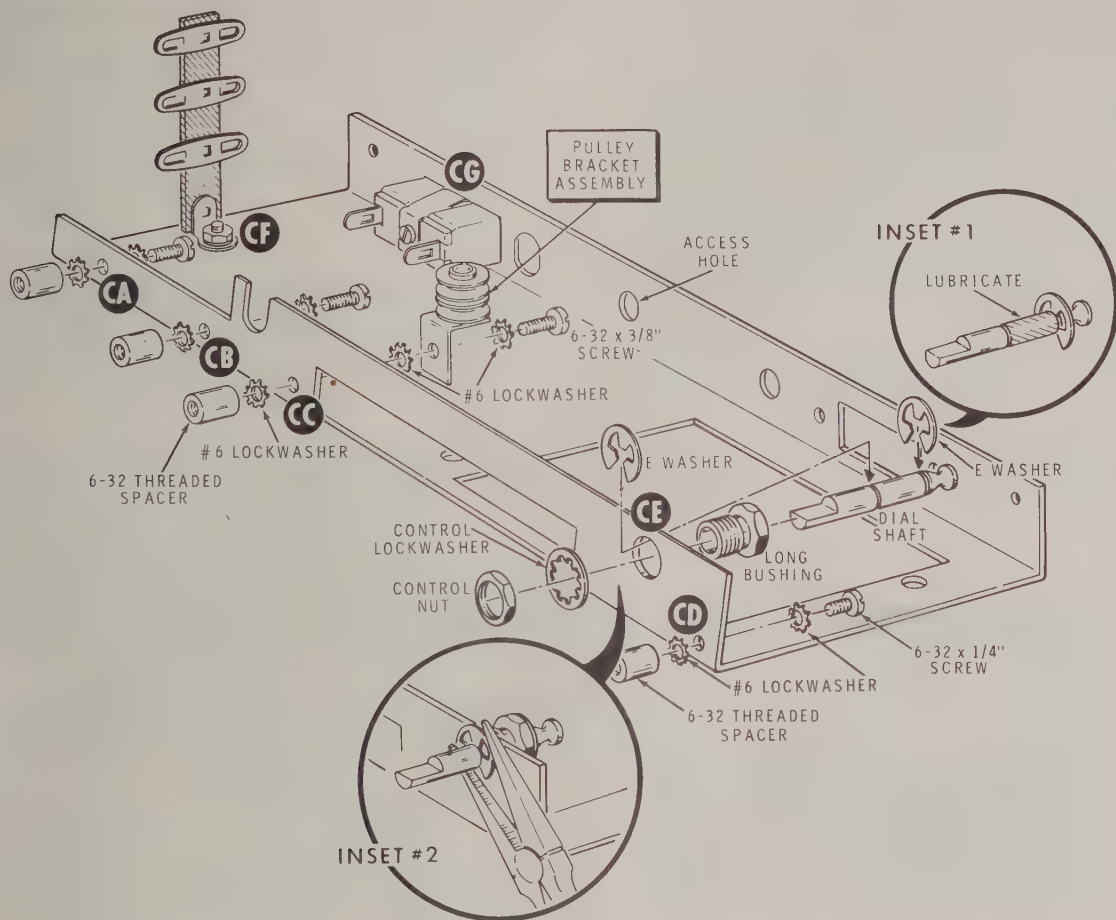


Detail 6A

- (✓) Refer to inset drawing #2 on Pictorial 6 and insert the dial shaft into the bushing at CE. Then, with pliers, install the other E washer into the front dial shaft groove.
- (✓) Refer to Detail 6A and mount the 3-lug terminal strip at CF. Use a 6-32 x 3/8" flat head screw, two #6 lockwashers, and a 6-32 nut. Position the terminal strip as shown and tighten the screw.
- (✓) Mount the AC socket at CG by pushing it into the hole from the rear as shown in Detail 6B.



Detail 6B



CHASSIS WIRING

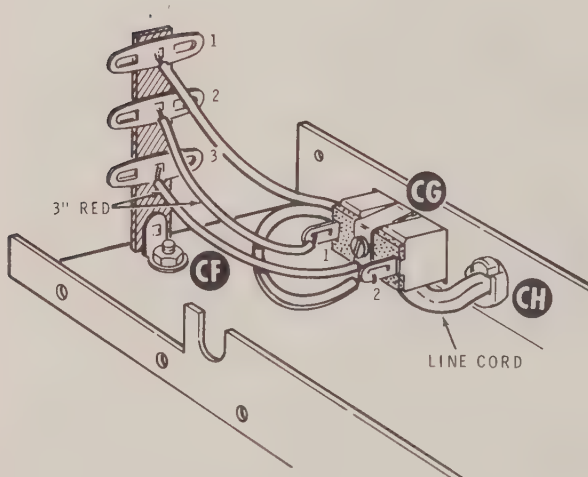
Refer to Pictorial 7 for the following steps.

NOTE: When wiring this kit, you will be instructed to prepare lengths of wire ahead of time, as in the following step. To prepare a wire, cut it to the indicated length and remove 1/4" of insulation from each end. When stranded wire is called for, melt a small amount of solder on the wire ends to hold the small strands together. Wires are listed in the order in which they will be used.

(✓) Prepare the following lengths of wire:

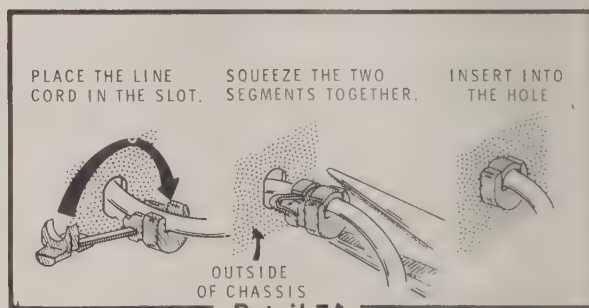
3" red solid

3" red solid

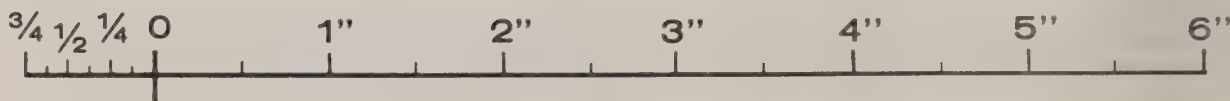


PICTORIAL 7

- (✓) Connect a 3" length of red solid wire from lug 1 of AC socket CG (S-1) to the eyelet in the center of lug 2 of terminal strip CF (S-1).
- (✓) Connect a 3" length of red solid wire from lug 2 of AC socket CG (NS) to the eyelet in the center of lug 3 of terminal strip CF (S-1).
- (✓) Locate the line cord. Twist the small wire strands of each lead together and apply a small amount of solder to keep the strands together. Pull the two wires apart 3" back from the ends of the wires.
- (✓) Place the end of the line cord through hole CH from the rear of the chassis. Connect one of the leads to lug 2 of AC socket CG (S-2). Connect the other lead to the eyelet in the center of lug 1 of terminal strip CF (S-1). Position the cord close to the bottom of the chassis and under the AC socket as shown in the Pictorial.
- (✓) Refer to Detail 7A and install the strain relief on the line cord and in hole CH as shown.



Detail 7A



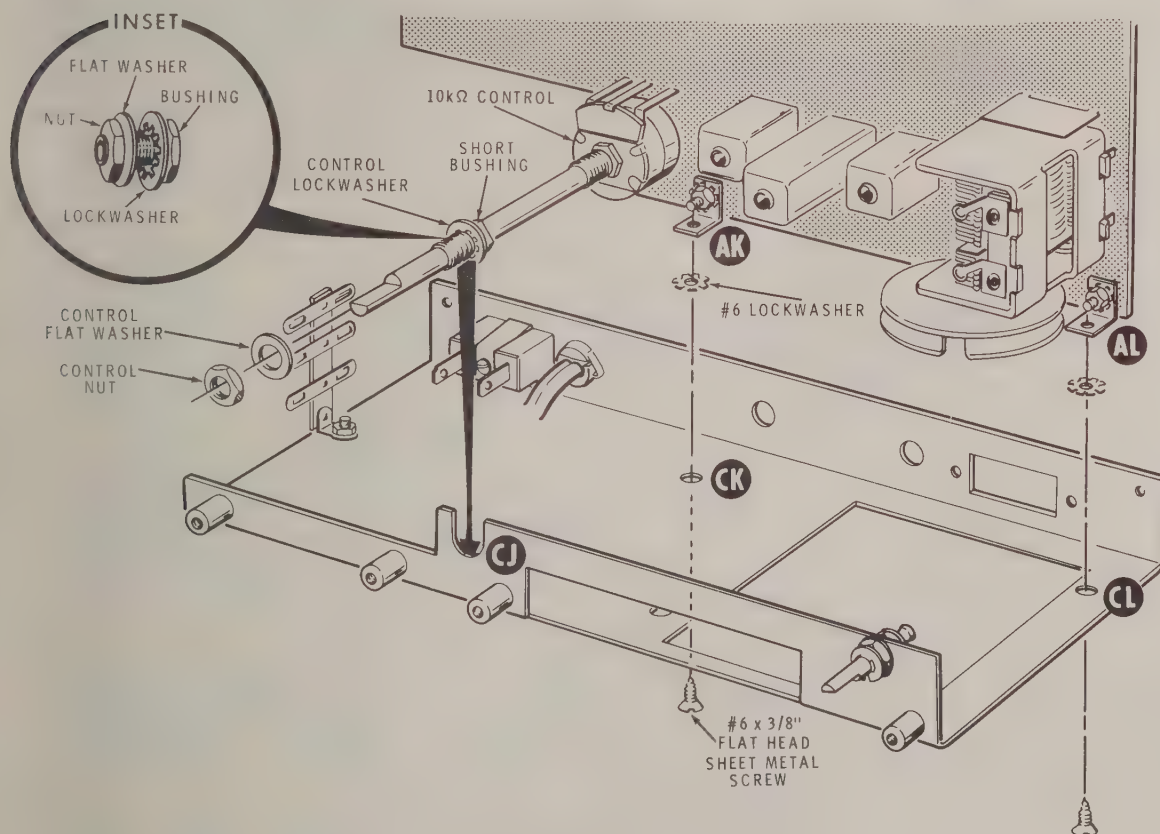
MOUNTING CIRCUIT BOARD TO CHASSIS

Refer to Pictorial 8 for the following steps.

- () Loosely assemble the short bushing, one control lockwasher, a control flat washer, and a control nut, as shown in the inset drawing.
- () Slip this assembly over the 10 k Ω control shaft, then place the circuit board assembly on the chassis and insert the assembled bushing in slot CJ. Make sure the lockwasher is inside the chassis.
- () Push the bushing assembly completely to the bottom of slot CJ. Tighten the control nut finger tight at this time.

- () Place a #6 lockwasher on the chassis near CK. Use a screwdriver to push the lockwasher into position between chassis hole CK and the L bracket. Fasten the L bracket in place with a #6 flat head sheet metal screw.
- () In the same manner, place a lockwasher between the L bracket and chassis hole CL. Fasten the L bracket in place with a #6 flat head sheet metal screw.
- () Now tighten the control nut on the bushing at CJ. Make sure the bushing is seated in the bottom of the slot.

NOTE: Turn the control shaft to make sure it is not binding. If it is, loosen the control nut and reposition the shaft slightly.

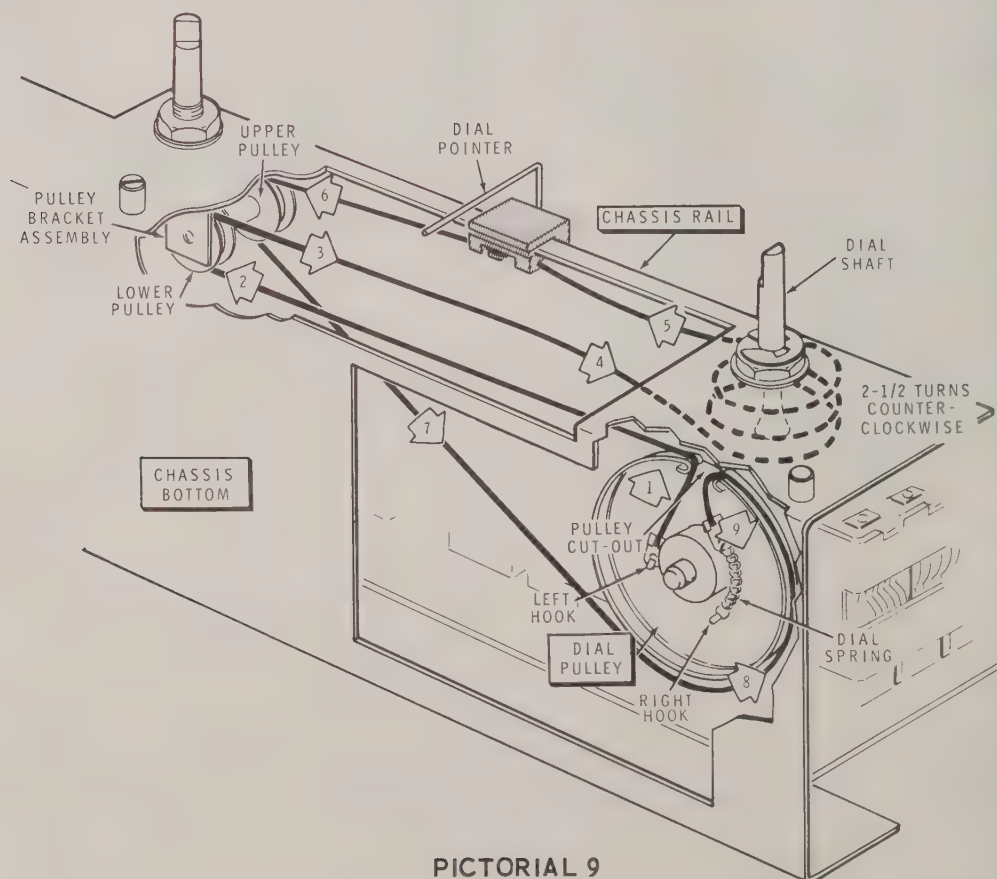


PICTORIAL 8

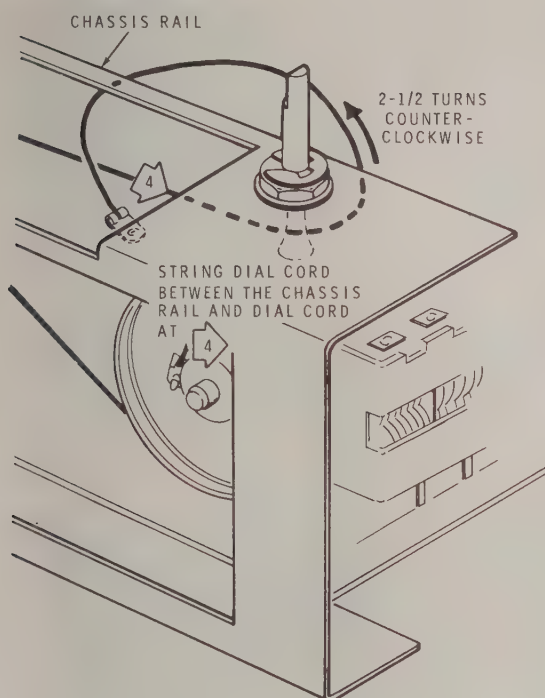
DIAL STRINGING

Refer to Pictorial 9 for the following steps.

- () Position the chassis assembly as shown and turn the tuning capacitor dial pulley fully counterclockwise.
 - () Locate the dial cord spring and place it within your reach.
 - () Locate the dial cord and hook one dial cord eyelet on the left hook of the dial pulley. Then bring the dial cord through the pulley cut-out and route it to the left.
 - () String the dial cord by following the numbered arrows on the Pictorial and the corresponding numbered instructions below.
1. To the pulley bracket assembly.
 2. Around the lower pulley from back to front.
 3. To the dial shaft.
 4. Refer to Detail 9A and route the cord between the chassis rail and the dial cord at 4; wrap the cord 2-1/2 turns counter-clockwise around the dial shaft.
 5. Route the cord as shown in the Pictorial to the upper pulley.
 6. Around the upper pulley front to back.
 7. To the dial pulley.
 8. Around the back of the pulley and into the pulley cutout.
 9. Attach the dial cord eyelet to the open eye of the dial cord spring. Then hook the other eye of the spring to the right dial pulley hook.



PICTORIAL 9



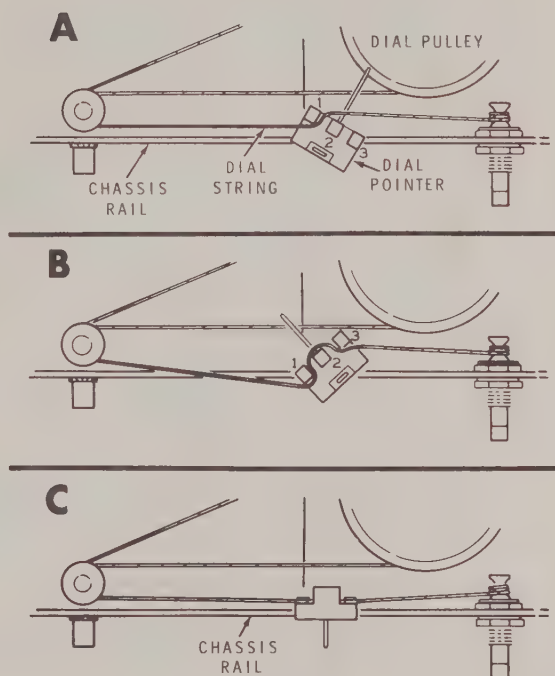
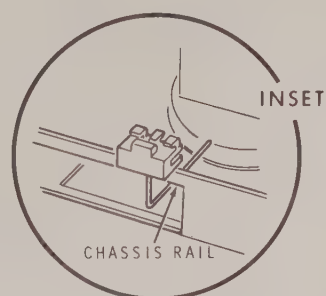
Detail 9A

- () Turn the dial shaft fully counterclockwise.
- () Now turn the dial shaft a full 2-1/2 turns clockwise; the tuning capacitor plates should be half opened.

Refer to Detail 9B for the following steps.

CAUTION: The paint on the dial pointer may be scratched easily. Therefore, keep the pointer away from the rail and other metal parts as the pointer is installed in the next few steps.

- () Refer to step A, lift the top dial cord and position the dial pointer at the center of the opening in the chassis, as shown in the inset drawing. Place the dial cord between tabs 1 and 2.
- () Refer to step B, twist the dial pointer counterclockwise and place the dial cord between tabs 2 and 3 of the dial pointer.



Detail 9B

- () Position the dial pointer on the chassis rail as shown in step C.
- () Turn the dial shaft clockwise, the dial pointer should travel toward the right. If not, recheck all the stringing steps as marked. Make sure the dial cord is strung around each pulley and shaft as shown in the Pictorial.

Set the chassis aside temporarily.

CLOCK ASSEMBLY, WIRING, AND MOUNTING

Refer to Pictorial 10 for the following steps.

- () Locate the clock motor and position it as shown.
- () Place the light reflector over the center shaft on the front of the clock motor.
- () If the clock window has paper backing, peel it off from both sides. Then place the window on the center shaft of the clock motor with the slot and small hole beneath it to the right.
- () Place the clock panel on the clock motor. Then loosely fasten the assembly together with two 6-32 x 3/8" flat head screws, two #6 lockwashers, and two 6-32 nuts at the top of the clock panel. Do not tighten these screws until directed to do so in a later step.

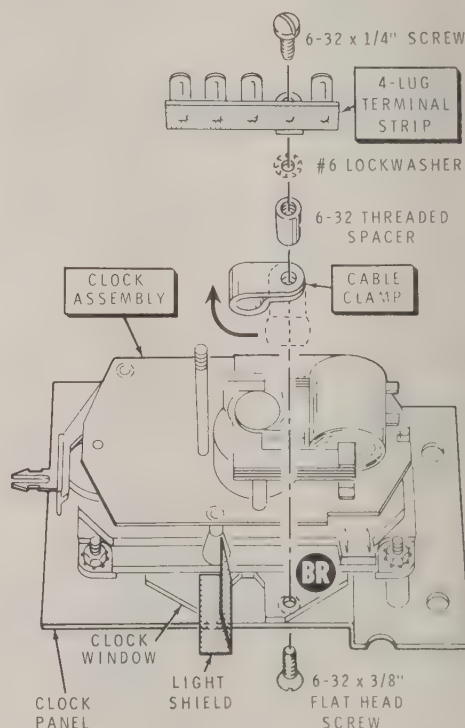
NOTE: The ears on either side of the center shaft of the clock motor are used to hold the clock motor against the light reflector.

- () Install two 6-32 x 1" flat head screws, two unthreaded spacers, two #6 lockwashers, and two 6-32 nuts at the bottom of the clock panel. Center the shafts of the clock motor in the holes of the clock panel.

Refer to Detail 10A as you mount the cable clamp and the 4-lug terminal strip in the following steps.

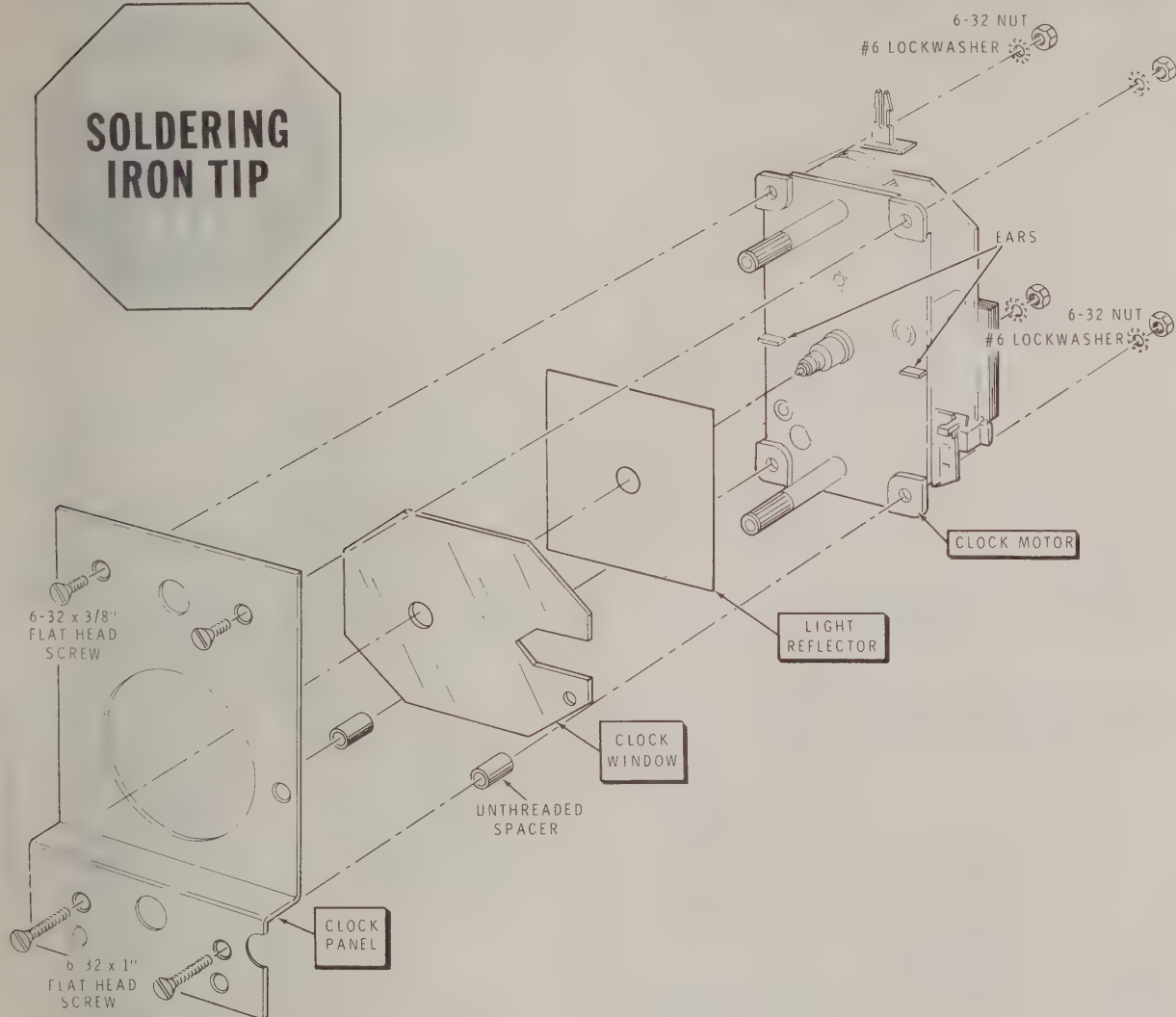
- () Line up the small hole in the clock window with hole BR in the clock panel.
- () Loosely mount the cable clamp at BR with its loop over the edge of the clock panel. Use a 6-32 x 3/8" flat head screw, and a 6-32 threaded spacer; do not tighten the screw.
- () Turn the clamp so it fits into the slot in the clock window; then tighten the screw.

- () Locate the 1" x 1" paper light shield and remove the protective backing. Fold the paper in the center to form a right angle, sticky side out. Position the light shield on the clock window, alongside the cable clamp as shown in the Detail. Press it firmly to the clock window and the cable clamp.
- () Mount the 4-lug terminal strip on the threaded spacer at BR with a 6-32 x 1/4" screw and a #6 lockwasher. Position the terminal strip as shown.



Detail 10A

SOLDERING IRON TIP



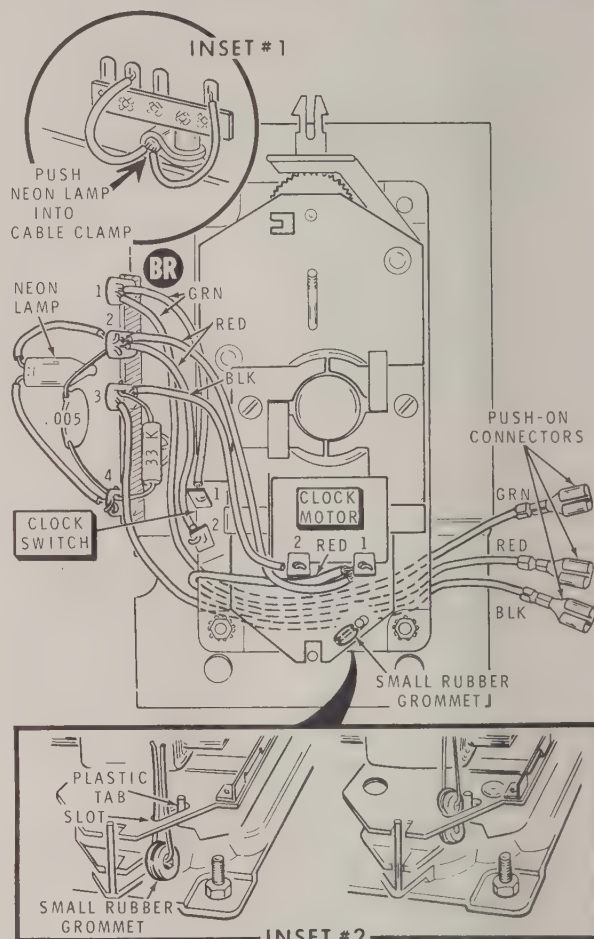
PICTORIAL 10

Refer to Pictorial 11 for the following steps.

- (A) Prepare the following lengths of stranded wire:

2-1/2" green
6-1/2" green
2-1/2" red
4-1/2" red
6-1/2" red
3-1/2" black
6" black

- (h) Connect a 2-1/2" green stranded wire from lug 1 of the clock switch (S-1) to lug 1 of terminal strip BR (NS). Be careful not to melt any of the plastic on the clock assembly.
- (✓) Connect one end of a 6-1/2" green stranded wire to lug 1 of terminal strip BR (S-2). The other end will be connected later.
- (✓) Connect a 2-1/2" red stranded wire from lug 2 of the clock switch (S-1) to lug 2 of terminal strip BR (NS).
- (✓) Connect a 4-1/2" red stranded wire from lug 1 of the clock motor (NS) to lug 2 of terminal strip BR (NS).
- (✓) Connect one end of a 6-1/2" red stranded wire to lug 1 of the clock motor (S-2). The other end will be connected later.
- (✓) Connect a 3-1/2" black stranded wire from lug 2 of the clock motor (S-1) to lug 3 of terminal strip BR (NS).
- (✓) Install a 33 kΩ (orange-orange-orange) resistor between lugs 3 (NS) and 4 (NS) of terminal strip BR.
- (✓) Install a .005 μF disc capacitor between lug 2 (NS) and lug 4 (NS) of terminal strip BR.
- (✓) Insert the neon lamp into the cable clamp as shown in inset drawing #1.
- () Cut two 1" lengths of sleeving, using insulation from the red solid wire. Place a length of sleeving on each lead of the neon lamp.

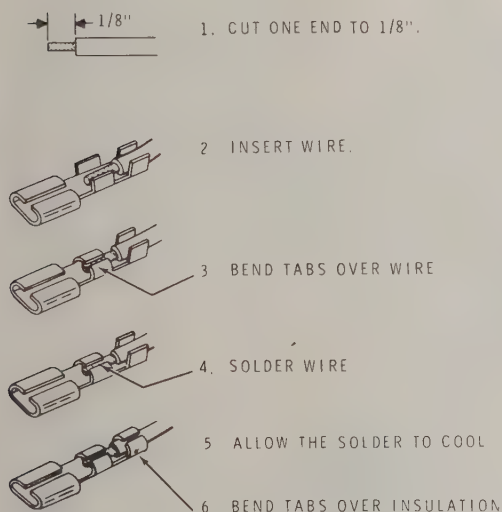


PICTORIAL 11

- (✓) Connect one neon lamp lead to lug 2 (S-4) and the other lead to lug 4 (S-3) of terminal strip BR. Make sure the leads are not touching each other at the base of the lamp.
- (✓) Connect one end of a 6" black stranded wire to lug 3 of terminal strip BR (S-3). The other end will be connected later.
- (✓) Make sure the wires connected to terminal strip BR are touching only the lugs they connect to.



- () Route the 6-1/2" green and 6" black wires from terminal strip BR and the 6-1/2" red wire from the clock toward lug 4 of terminal strip BR. Then route the three wires between the clock and the unthreaded spacers, and out the side of the clock as shown.
- () Refer to Detail 11A and install push-on connectors on the free ends of the green, black, and red wires routed in the last step. Do not run the solder into the push-on section of the connectors.



Detail 11A

- () Install push-on connectors on the free ends of the black and red stranded wires coming from holes B and R on the circuit board.
- () In the same manner, install a push-on connector on each black lead from the power transformer.

*Refer to inset drawing #2 on Pictorial 11 for the following steps.

- () Locate the remaining long capacitor lead that was saved from the circuit board assembly. Bend this wire in half and position it through the grommet as shown.

- () Insert the free ends of this wire through the indicated slot in the metal frame of the clock assembly. Note the position of the plastic tab.
- () Pull on this wire until the grommet is half-way through the slot as shown.
- () Carefully remove the bare wire without moving the grommet.

Refer to Pictorial 12 (fold-out from this page) for the following steps.

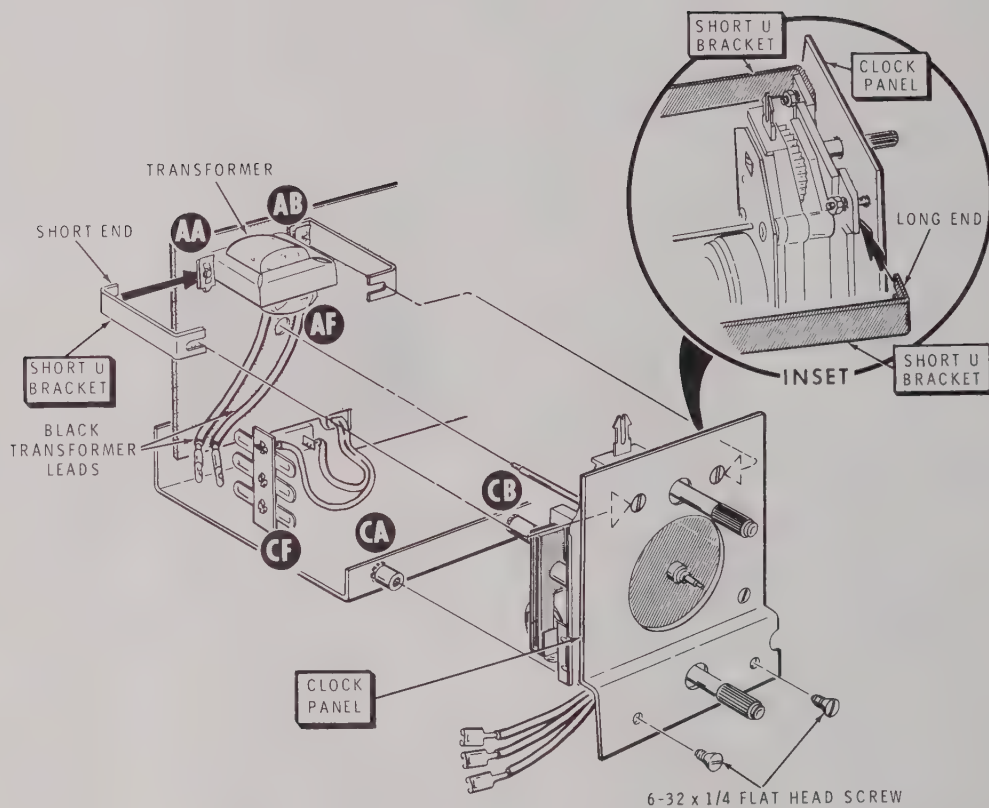
- () Position the black transformer leads out the left side of the circuit board as shown.

CAUTION: Use care when positioning the line cord and leads in the next step, as terminal strip CF could be damaged.

- () Position the line cord and the other red leads down against the chassis and flat against terminal strip CF.

NOTE: The short U bracket on the left side of the transformer will be removed in the next step. Note that the large end is toward the front. When this bracket is reinstalled later, position it the same way.

- () Loosen the screws at AA and AB and remove the U bracket at AA.
- () Refer to the Pictorial and mount the lower part of the clock on spacers CA and CB with 6-32 x 1/4" flat head screws. Do not tighten the screws at this time.
- () Refer to the inset drawing on Pictorial 12 and slip the end of the U bracket from AB between the clock panel and the clock motor.
- () Place the small end of the short U bracket (removed earlier) between the transformer and the circuit board at AA. Place the large end between the clock panel and the clock motor. Do not tighten the screws.
- () Tighten the screws at CA and CB.
- () Align the two short U brackets as shown by the arrows and tighten the four mounting screws.



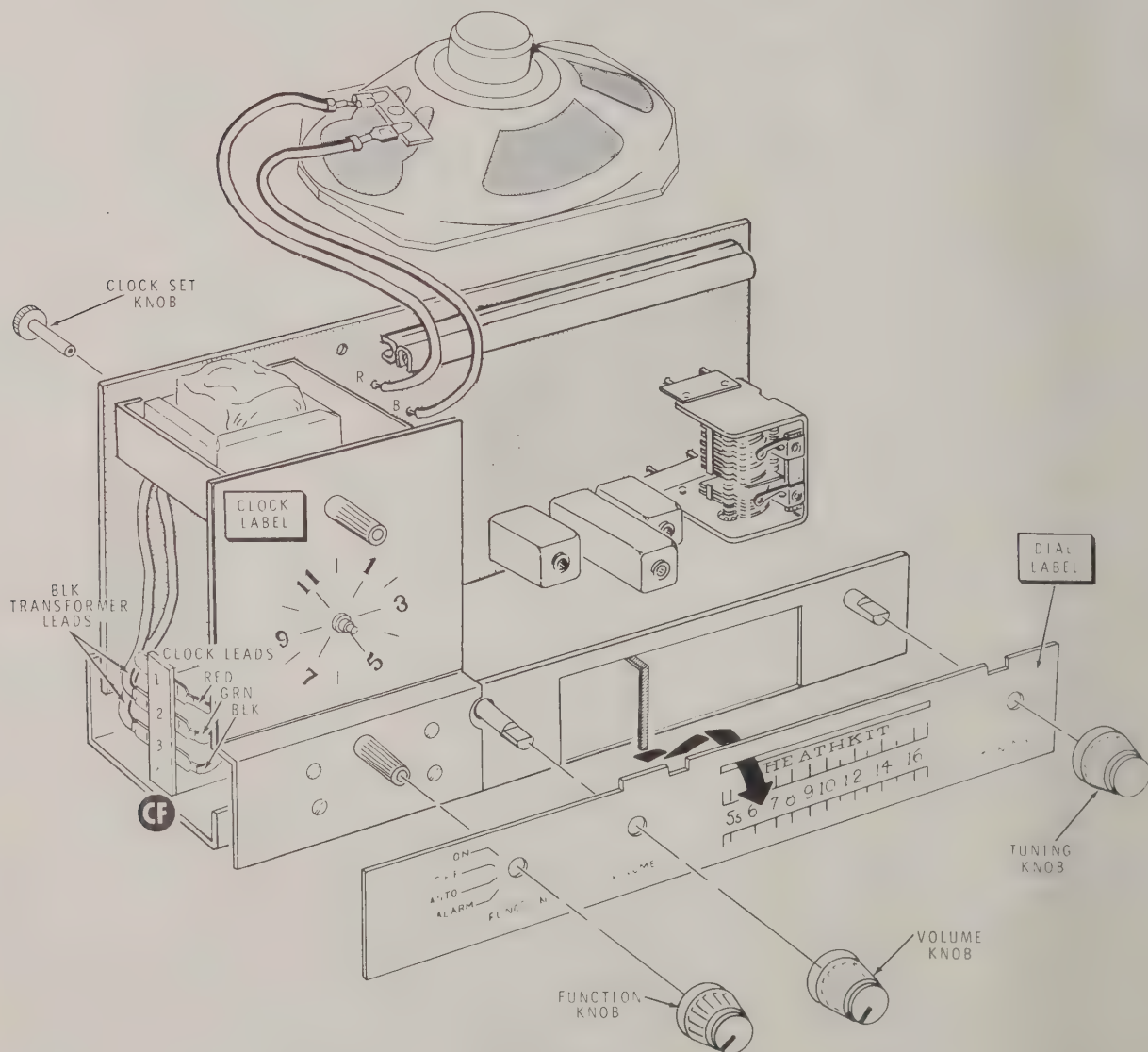
PICTORIAL 12

Refer to Pictorial 13 for the following steps.

- () Connect either transformer push-on lead to lug 2 and the other lead to lug 3 of terminal strip CF. Be careful not to bend the terminal strip. Do not solder these connectors.
- () Connect the red clock push-on lead to lug 1 of terminal strip CF. Do not solder this connector.

- () Connect the green push-on lead to lug 2 of terminal strip CF. Do not solder this connector.
- () Connect the black push-on lead to lug 3 of terminal strip CF. Do not solder this connector.

NOTE: When handling the speaker in the following steps, be careful not to damage the paper speaker cone.



PICTORIAL 13

- () Locate the speaker and attach the black push-on lead from circuit hole B to either lug of the speaker. Attach the red push-on lead from hole R to the other speaker lug. Do not solder these connectors.

NOTE: The dial label and knobs will be installed temporarily for Initial Test and Adjustments. Then they will be removed to complete Final Assembly.

KNOB AND LABEL INSTALLATION

- () Position the speaker in back of the radio so it is out of the way for easy access to the front of the radio.
- () Locate the dial label and slide the narrow slot in the label over the dial pointer. Then install the label over the three shafts.
- () Place the knob without the pointer on the Tuning shaft by aligning the flat on the inner part of the knob with the flat on the shaft.

- () Position the Volume knob with the flat on the inner part aligned with the flat on the Volume control shaft. Then push the knob onto the shaft.

NOTE: When installing the function knob, match the knurled edges to the knurled edges of the shaft.

- () Turn the Function control fully counterclockwise.
- () Position the pointer on the Function knob to the Alarm position on the dial label. Push the knob onto the Function shaft.
- () Place the clock label on the shaft of the clock.
- () Turn the radio around and screw the clock-set knob onto the clock-set shaft. This shaft protrudes through a hole in the circuit board directly behind the clock assembly.

This completes the major assembly. Proceed to Initial Test.

INITIAL TEST

Refer to Figure 1 (fold-out from Page 20) for the following steps.

- () Turn the LULL-TO-SLEEP shaft fully counterclockwise.
- () Turn the FUNCTION knob fully clockwise, and then counterclockwise one notch (OFF position).
- () Turn the VOLUME knob so the pointer is straight up.

NOTE: If you encounter any difficulty during the following adjustments, unplug the Radio and refer to the In Case of Difficulty section of the Manual. Then, after the trouble is located and corrected, return to this section and complete the following steps. Do not make any adjustments if a station is not heard when the Radio is first turned on and tuned to a station. The factory preadjustments are close enough so a station will be heard if everything is operating properly.

CAUTION: When the line cord plug is connected to an AC outlet, 120 VAC will be present at

the three lugs of terminal strip CF (Pictorial 13) and the AC socket. Be careful that you do not touch these points or you could receive a severe electrical shock.

- () Plug in the Radio; the neon lamp behind the clock should light.
- () Turn the FUNCTION knob clockwise one notch to the ON position. Some noise should be heard from the speaker.
- () Tune in a station and adjust the VOLUME control for a comfortable listening level.
- () Turn the FUNCTION knob one notch counterclockwise to the OFF position.
- () Unplug the Radio.

NOTE: Proper adjustments are important for good operation of the Radio. Read through and understand the entire section before you actually make the adjustments.

Proceed to the Adjustments section.

ADJUSTMENTS

RADIO ADJUSTMENTS

Refer to Figure 1 (fold-out from Page 20) for the following steps.

- () Carefully peel the paper backing from the blue and white identification label. Press the label into place over the large hole on the rear apron of the chassis.

NOTE: The blue and white label shows the Model Number and Production Series Number of your Kit. Refer to these numbers in any communications with the Heath Company; this assures you that you will receive the most complete and up-to-date information in return.

- () Turn the TUNING knob fully clockwise and adjust the dial pointer by sliding it until it is just to the right of the vertical line at the right end of the pointer slot as shown.

- () Turn the TUNING knob fully counterclockwise. The end of rotation should bring the pointer to the same place at the left end. If it does not, adjust the dial pointer until it stops the same distance from each end.

- () Locate the two holes in the back of the Radio on the circuit board marked "OSC" and "ANT". By inserting a small screwdriver shaft through these holes, the trimmer capacitors on the tuning capacitor can be

adjusted. Turn each of these trimmer capacitor screws clockwise until they are snug. Then, turn each of the screws 1/8 turn counterclockwise.

NOTE: In the following steps, be careful that you do not turn the slugs of the transformers more than the limits given in the steps, or instrument alignment may be required. To prevent this from happening, put a flag (piece of tape) on the alignment tool as shown in Figure 2. The flag will indicate how far the slug has been turned.

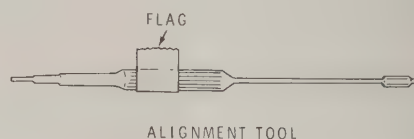


Figure 2

- () Plug in the Radio, turn the FUNCTION switch to the ON position.
- () Turn on a source of electrical noise such as a fluorescent lamp, an electric shaver, or an electric mixer. Adjust the VOLUME to a comfortable listening level.
- () Place the Radio near the noise source so that static is heard. Turn the tuning knob so the dial pointer is near the low frequency end (near 6) of the dial. Do not tune in a station.

- () Place the alignment tool into the top of oscillator coil L1. Turn the slug in this coil slowly in either direction, not more than one turn, until the loudest noise is heard. If a station appears during this adjustment, turn the TUNING knob slightly until no station is heard. Lower the VOLUME if necessary.
- () Turn off the noise source.
- () Turn the TUNING control until a known station is heard at the high end (between 14 and 16) of the dial. If you do not know the exact frequency of the station, refer to a local newspaper. NOTE: Usually the newspaper will list the frequency of the radio station in kilohertz (kHz). Thus, if the frequency of the station is 1420 kHz, you should be able to hear that station on your Radio just above 14 on the dial. It may be as low as 13 or as high as 15 until after the next adjustment.
- () Turn the TUNING knob until the pointer indicates the correct frequency for the station you have selected.
- () Adjust the trimmer capacitor marked OSC slightly in either direction, but no more than 1/4 turn, until you hear the station you are seeking.
- () Again, turn on the noise source and turn the TUNING knob until the pointer is near the 6 on the dial. Slightly readjust coil L1 for maximum noise. Turn off the noise source. Check the station at the high end of the dial once again, and if necessary, readjust the OSC trimmer capacitor very slightly so the station appears at the correct setting of the dial. NOTE: The reason for repeating this step is because coil L1 and the OSC trimmer capacitor interact and the adjustment of one may slightly affect the adjustment of the other.

- () Tune the Radio to a weak station somewhere between 1200 and 1400 kHz (12 and 14). Adjust the trimmer capacitor marked ANT for maximum volume, but not more than 1/4 turn in either direction.

This completes the Adjustments. The IF transformers T1 and T2 have been preset at the factory and should not require further adjustment. Performing the following two steps may result in slightly improved reception of very weak stations.

- () Again tune the Radio to a very weak station and carefully adjust the slugs in the top and bottom of IF transformer T1 for maximum volume; do not turn either slug more than 1/4 turn in either direction. See Figures 1 and 3.

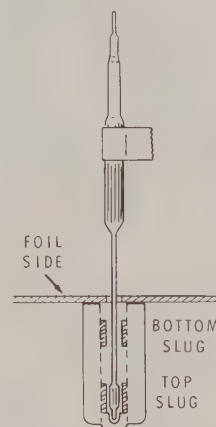
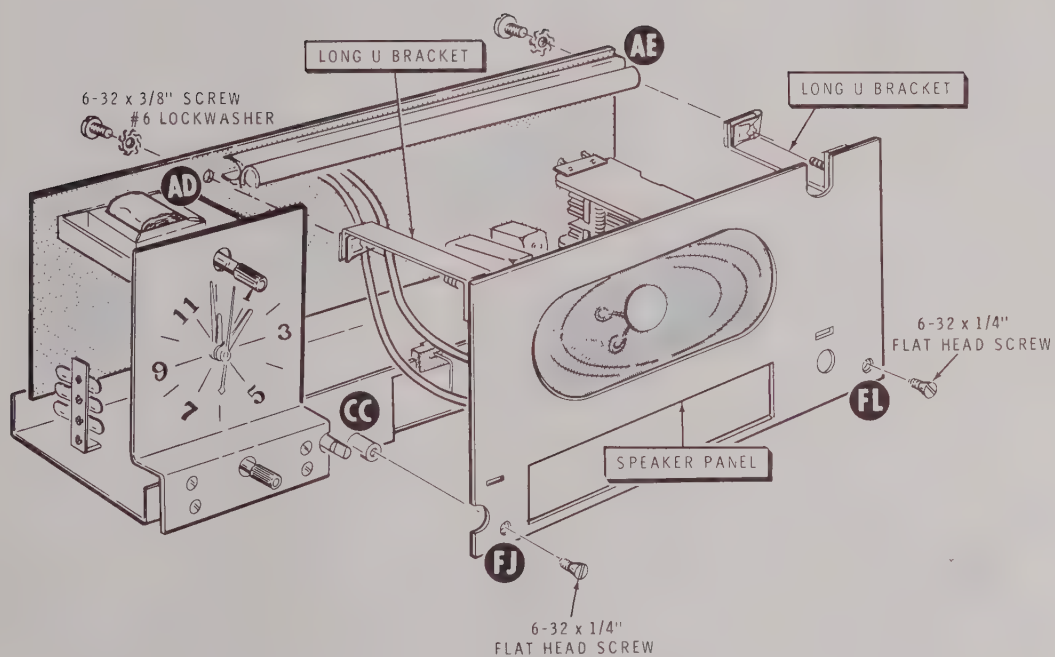


Figure 3

- () Adjust the slug in IF transformer T2 not more than 1/4 turn in either direction for maximum loudness.

This completes the Radio Adjustments. Proceed to the Clock Adjustments.



PICTORIAL 14

FINAL ASSEMBLY

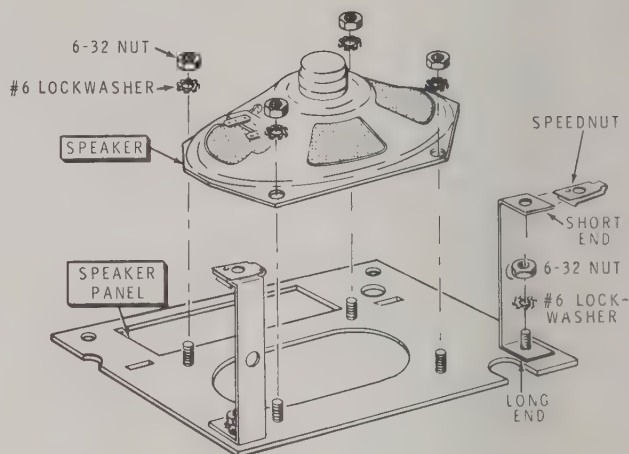
SPEAKER MOUNTING

- () Remove the Clock-Set knob by pushing it in and turning it counterclockwise.
- () Remove the knobs installed earlier by pulling straight out from the Radio. Remove the Volume knob first.
- () Remove the dial label.
- () Disconnect the speaker leads from the speaker.

Refer to Pictorial 14 for the following steps.

CAUTION: When installing the speaker in the following step, be careful not to puncture the speaker cone on the studs.

- () Position the speaker with the terminal strip as shown in Detail 14A. Then fasten the speaker to the speaker panel with four #6 lockwashers and four 6-32 nuts.
- () Locate the long U brackets. Place a speednut on the short end of each bracket.
- () Mount the two U brackets on the two remaining speaker panel studs with #6 lockwashers and 6-32 nuts as shown in Detail 14A.
- () Reconnect the speaker leads to the speaker terminals.
- () Fasten the speaker panel to the Radio. Use 6-32 x 1/4" flat head screws in holes FJ and FL.
- () Attach the ends of the U brackets to the circuit board at AD and AE with 6-32 x 3/8" screws and #6 lockwashers.

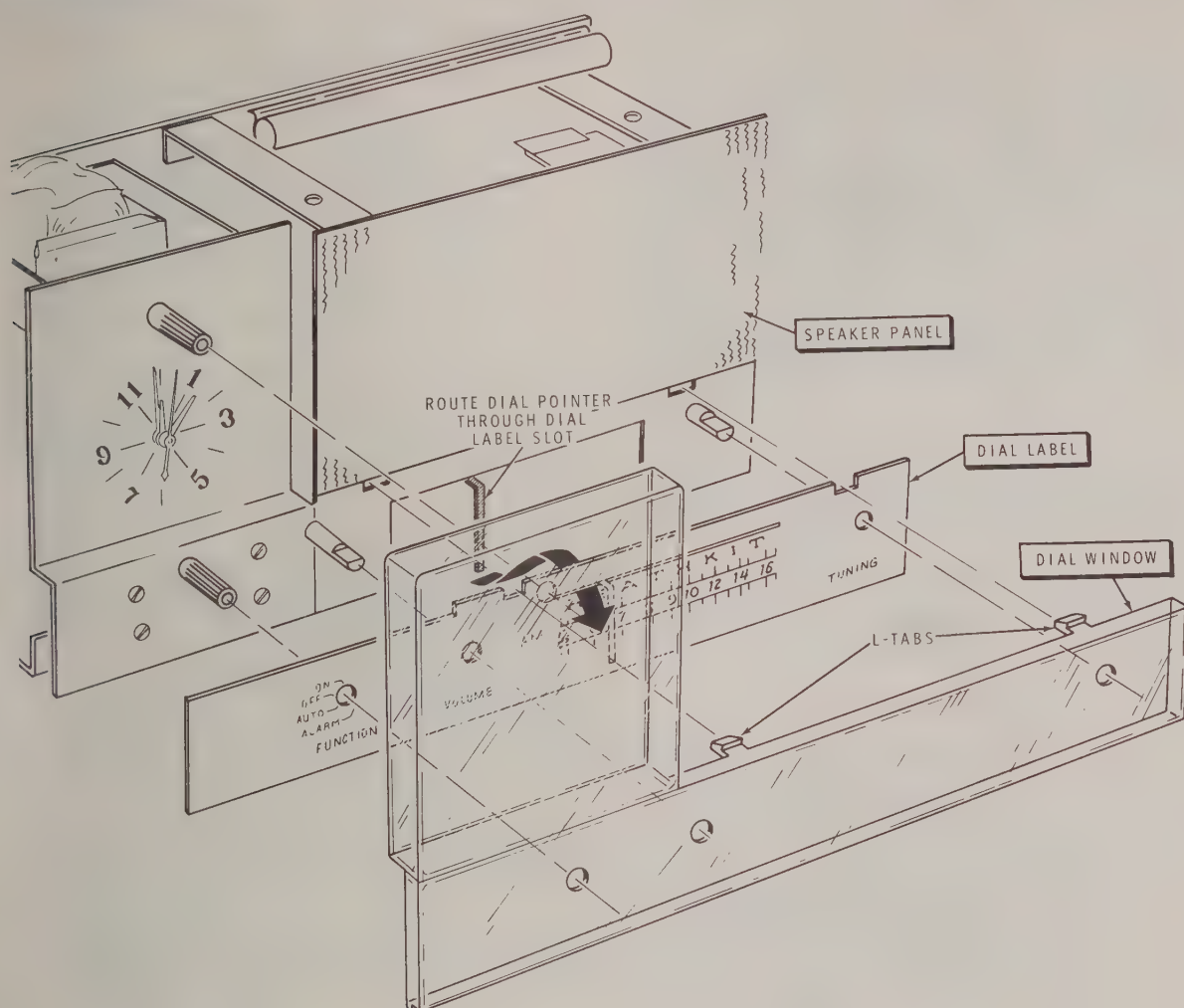


Detail 14A

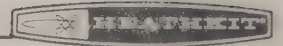
DIAL WINDOW, KNOBS, AND EDGE MOLDING

Refer to Detail 15A for the following steps.

- () Slide the narrow slot on the dial label over the dial pointer. Then reinstall the label over the three shafts.
- () Clean the dial window with a lint-free cloth.
- () Place the dial window over the four control shafts.
- () Position the dial window so the two L-shaped tabs at the top of the long narrow section fit into the slotted holes in the speaker panel. Push the assembly together.



Detail 15A

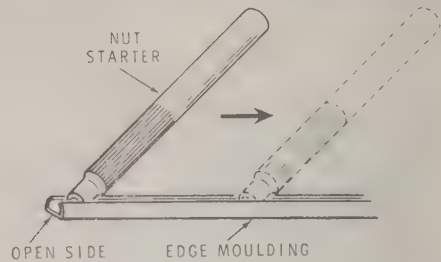


Refer to Pictorial 15 for the following steps.

- () Reinstall the Volume and Tuning knobs.

NOTE: The Function and Lull-To-Sleep knobs are held in place by matching their knurled edges with the knurled edges of the shafts.

- () Turn the Function shaft completely counter-clockwise.
- () Position the Function knob with the indicator in line with the word Alarm. Push the knob onto the shaft.
- () Rotate the Function knob to check the other three positions. Remove and reposition the knob if necessary.
- () Turn the Lull-To-Sleep shaft fully counter-clockwise. Align the indicator dot on the knob with the "0." Push the knob onto the shaft.

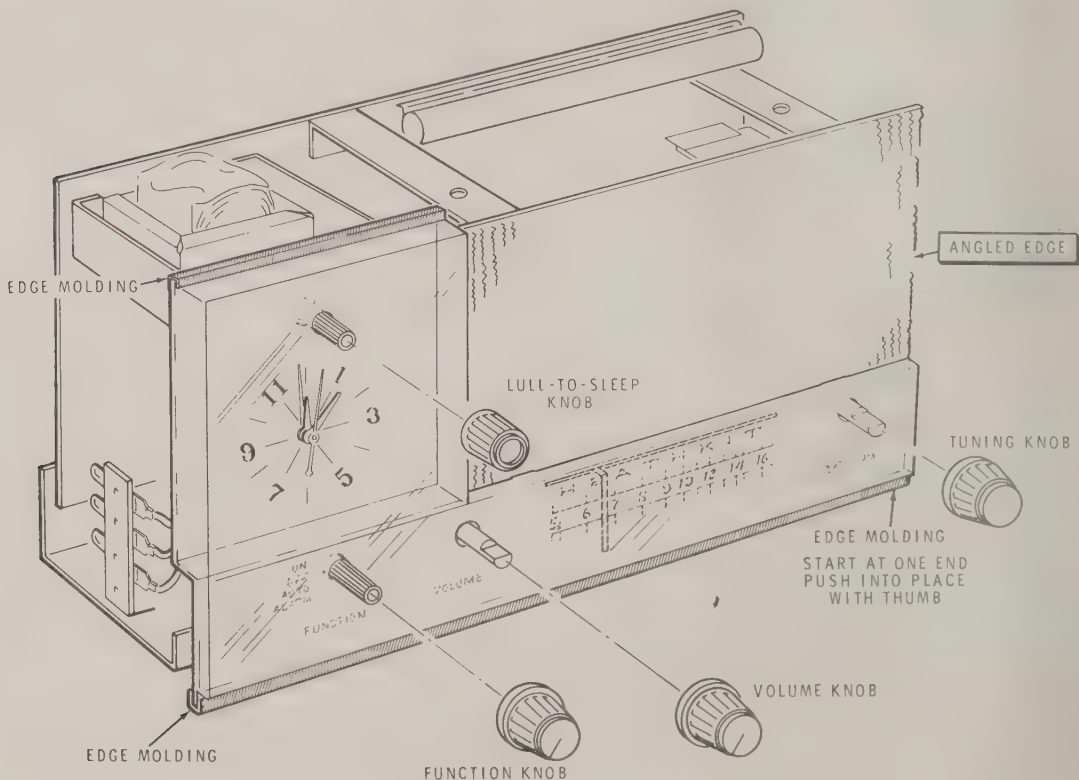


Detail 15B

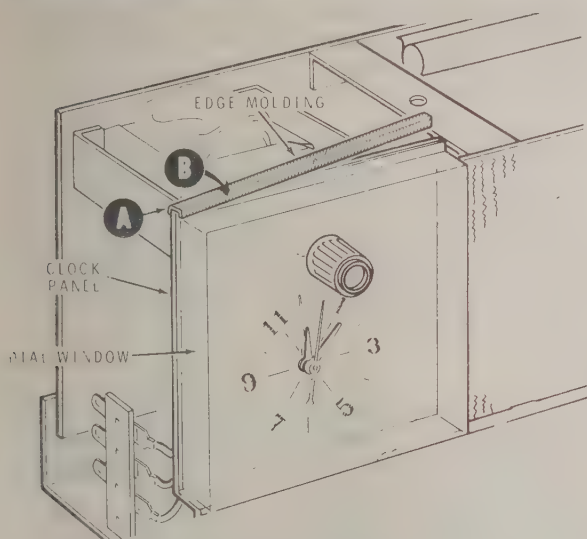
Refer to Detail 15B for the following steps.

NOTE: The edge molding will be much easier to install in the next step if it is first spread open.

- () Run the small end of the plastic nut starter through the open side of both lengths of edge molding several times.



PICTORIAL 15



Detail 15C

Refer to Detail 15C for the following steps.

- () Position the 3" length of edge molding over the clock panel as shown at A.
- () Roll the edge molding over the dial window as shown at B. Then work the edge molding into position.
- () Position the Radio upside down. In a similar manner, install the remaining edge molding over the clock panel and speaker panel.

SPEAKER GRILLE

Included with your Radio is a two-sided sticky-back grille mounting gasket and a factory-prepared speaker grille. With the gasket you may custom match your Radio grille to a fabric in your home.

If you prefer using the speaker grille furnished, perform the steps below titled Speaker Grille Installation; then do not use the grille mounting gasket. If you prefer to custom match your speaker grille, perform the steps below titled Custom Grille Preparation and Speaker Grille Installation; then do not use the factory-prepared speaker grille.

Custom Grille Preparation

The factory-prepared speaker grille cloth included with your Radio is a special speaker fabric made to look like heavy cloth, but yet let the Radio sound come through. Sound radiates from a speaker from both the front and the rear. Since the Radio is not in its cabinet at this time, test the custom fabric you have selected by placing it like a blanket over the Radio. The Radio should sound the same with or without the fabric. The custom fabric used must also have a ravel-free edge to give a neat appearance.

- () Position the grille mounting gasket with the holes grouped to the lower right. Mark this side "rear."
- () Iron out any wrinkles from the fabric.
- () Lay the fabric on a flat surface, face down.
- () Peel the paper from the front of the gasket.
- () Place the gasket squarely on the fabric and smooth it into position with a rolling pin or some other cylindrical object.
- () Very carefully trim off the excess fabric around the edges of the gasket with sharp scissors or a razor blade.
- () Proceed to Cabinet Installation.

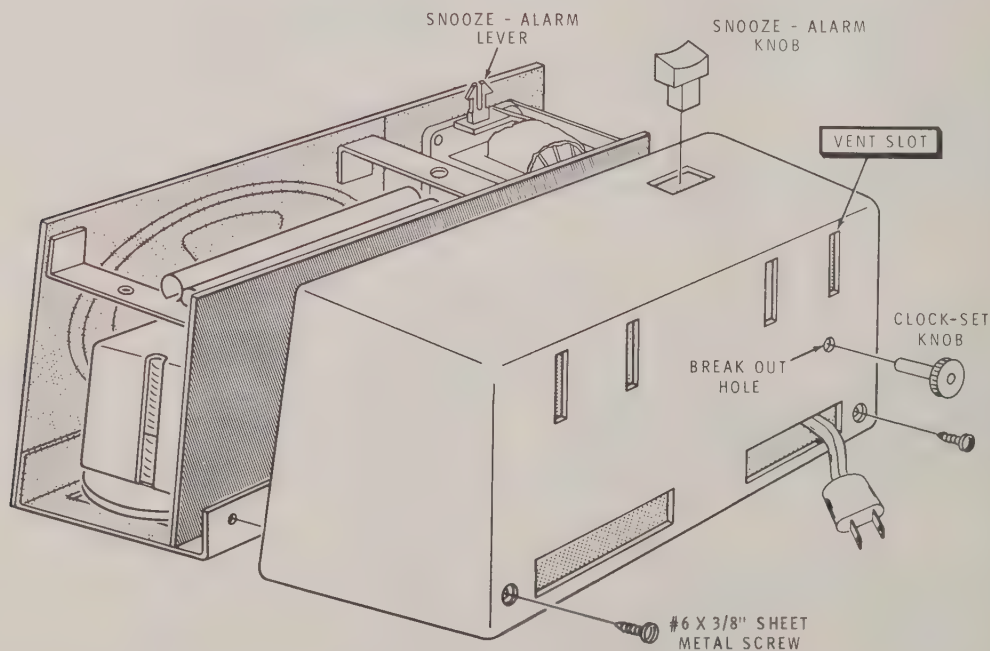
Speaker Grille Installation

NOTE: The speaker grille has one angled side. Try the grille for proper position by placing it on the speaker panel before you remove the paper backing. The holes on the back of the grille should be centered over the speaker cutout.

- () Peel the paper backing from the speaker grille cloth.
- () Position the left side and the bottom of the grille cloth to line up with the edges of the dial window. Press the top of the grille cloth in place and smooth the rest of the grille against the panel.

CABINET INSTALLATION

- () Locate the cabinet and identify the indicated vent slot as shown in Pictorial 16.
 - () Look into the cabinet and locate the small indentation under this vent slot.
 - () With a point of your long-nose pliers or an awl, make a hole in the center of the indentation. Trim the hole as needed with a knife to the size of the breakout.
 - () Fit the Snooze-Alarm knob into the knob opening in the top of the cabinet to see that it moves up and down freely in the cutout. If it does not move freely, use a knife and trim off any burrs from the opening before proceeding with the next step.
 - () Place the cabinet behind the Radio as shown.
 - () Pull the line cord through the lower right-hand rectangular opening in the cabinet back.
- NOTE: In the following step, it may be necessary to depress the Snooze-Alarm lever to clear the top of the cabinet.
- () Guide the Radio into the cabinet with the help of the line cord. Position the snooze alarm lever in its cutout. Align the small holes in the rear of the chassis with the corresponding holes in the cabinet. Then fasten the Radio in the cabinet with two #6 sheet metal screws.
 - () Insert the Clock-Set knob through the round hole in the rear of the cabinet, as shown. Screw the knob on the shaft in a clockwise direction.
 - () The top of the Snooze knob is cut at the same angle as the top of the cabinet. Position the knob accordingly over the rectangular opening in the top of the cabinet and push the knob into position on the prongs.



PICTORIAL 16

OPERATION

Refer to Figure 6 for the location of the controls.

HOW TO SET THE CLOCK

Pull out the **CLOCK-SET** knob at the rear of the cabinet and rotate it clockwise until the hour and minute hands indicate the correct time.

HOW TO OPERATE THE RADIO

NOTE: Since the rod antennas used in modern radios are directional, it may be necessary to turn the radio slightly to improve reception of some desired stations.

1. Turn the **FUNCTION** switch to the **ON** position.
2. Turn the **TUNING** knob to select the desired station and adjust the **VOLUME** control to the desired volume level.

TO LULL-TO-SLEEP WITH MUSIC AND TURN OFF THE AC SOCKET

With the **FUNCTION** switch in the **OFF**, **AUTO**, or **ALARM** position, turn the **LULL-TO-SLEEP** knob to the length of time you desire to have the Radio play; or have the AC outlet remain on. 60 represents about 60 minutes, 30 represents about 30 minutes, etc. **NOTE:** The **LULL-TO-SLEEP** knob will not work if:

1. The **FUNCTION** switch is in the **ON** position.
2. The **FUNCTION** switch is in the **AUTO** or **ALARM** position and was not turned to **OFF** at least once since the alarm last sounded.

TO WAKE TO MUSIC AND ALARM

1. Turn the **FUNCTION** switch to the **ON** position.
2. Tune the Radio to the desired station and adjust it for the desired volume.
3. Push in the **CLOCK-SET** knob at the rear of the cabinet and rotate it clockwise until the alarm hand indicates the desired wake-up time.
4. A. Turn the **FUNCTION** switch to the **AUTO** position to wake up to a radio station only. The Radio will turn on about 10 minutes before the time indicated by the alarm hand.
B. If you turn the **FUNCTION** switch to the **ALARM** position, the alarm will sound approximately 10 minutes after the Radio turns on. The alarm may then be silenced for an additional 10 minutes if you push in the **SNOOZE** button. After 10 minutes, the alarm will sound again, and it will continue to sound every 10 minutes after the **SNOOZE** button is pushed until the **FUNCTION** switch is turned to **AUTO**, **OFF**, or **ON**.

HOW TO USE THE AC OUTLET

Set the alarm hand to the desired time and the **FUNCTION** switch to **AUTO**. The AC outlet and Radio will now be turned on at the desired time.

If you do not want to listen to the Radio; turn the **VOLUME** control fully counterclockwise. For further use of this socket, see "**TO LULL-TO-SLEEP WITH MUSIC AND TURN OFF THE AC SOCKET.**" The AC outlet is always on when the Radio is on.

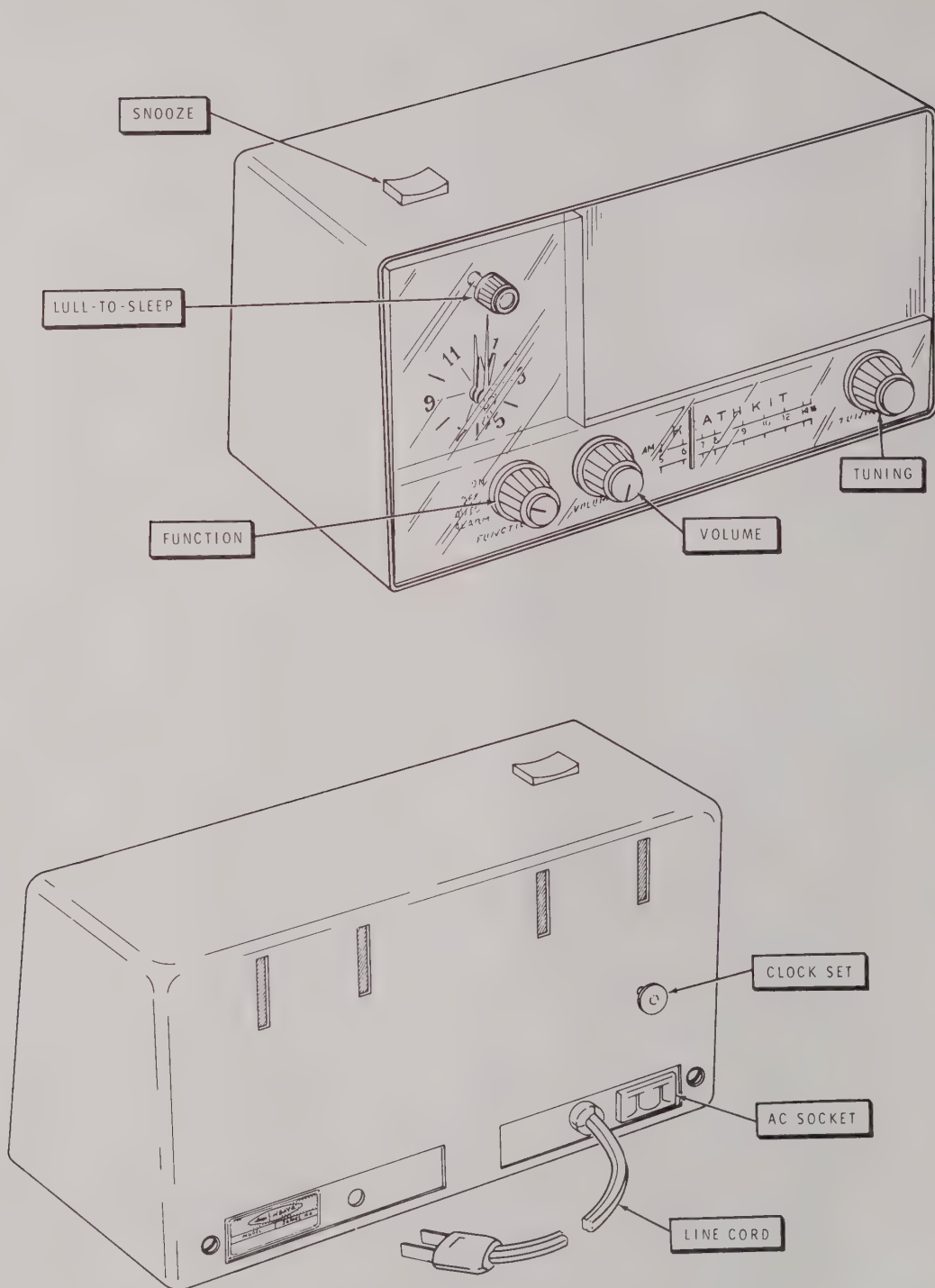
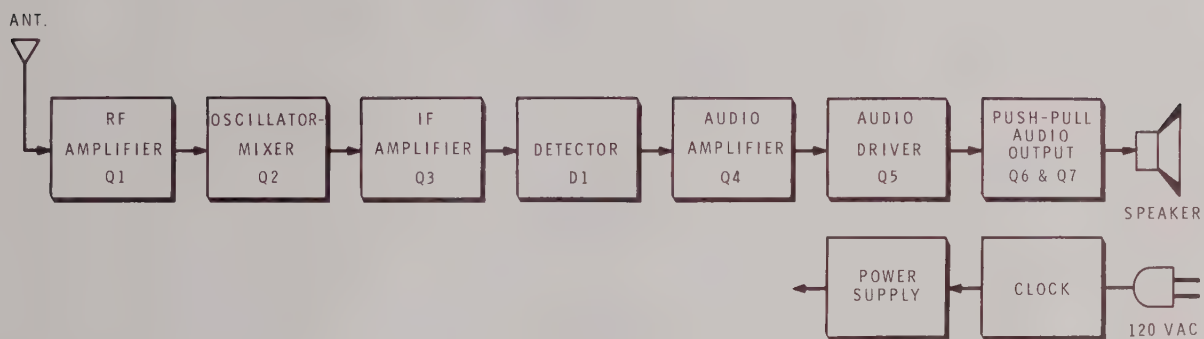


FIGURE 6





BLOCK DIAGRAM

IN CASE OF DIFFICULTY

VISUAL CHECKS

NOTE: Refer to the Circuit Board X-Ray View (fold-out from Page 38) to locate parts.

1. Recheck the wiring. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something you have consistently overlooked.
2. About 90% of the kits that are returned to the Heath Company for repair do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by resoldering all connections to make sure they are soldered as described in the Soldering section of the Kit Builders Guide.
3. Check the value of the parts. Be sure that the proper part has been installed on the circuit board in each step, as shown in the Pictorial diagrams and as called out in the wiring instructions.
4. Check for bits of solder, wire ends, or other foreign matter which may be lodged in the wiring or between adjacent foils on the circuit board.
5. If, after careful checks the trouble is still not located and a voltmeter is available, check voltage readings against those shown on the Schematic Diagram (fold-out from Page 39) and on the Voltage Chart (fold-out from Page 38). **NOTE:** All voltage readings were taken with a high input impedance voltmeter. Voltages may vary as much as $\pm 20\%$.
6. A review of the Circuit Description may also help you find the trouble if you have a knowledge of electronics.

NOTE: In an extreme case where you are unable to resolve a difficulty, refer to the Service and Warranty sections of the "Kit Builders Guide", and to the "Factory Repair Service" information on this page.

POINT-TO-POINT TEST

The Point-To-Point Test is easily made without the use of instruments, and will help to locate the problem area. Use this test when you get no sound or when there is noise but no station is heard.

Touch the indicated test points with the blade of a screwdriver. Hold the screwdriver so that your finger touches the blade. Do not touch any other part of the Radio, or any other object, with your other hand. **CAUTION:** 120 VAC is present in some parts of the Radio, and may cause severe electric shock. **TOUCH ONLY THE POINTS INDICATED.**

As each Test Point (TP) is touched, a certain sound will be heard in a properly operating circuit. If you do not hear the proper sound, the trouble probably lies between the test point you are touching, and the one you last touched which gave the proper sound. Refer to the following Troubleshooting Chart and Voltage Chart for making the Point-To-Point tests.

FACTORY REPAIR SERVICE

You can return your completed kit to the Heath Company Service Department to have it repaired for a minimum service fee. (Kits that have been modified will not be accepted for repair.) If you wish, you can deliver your kit to a nearby Heath Authorized Service Center. These centers are listed in your Heathkit catalog.

To be eligible for replacement parts under the terms of the warranty, equipment returned for factory repair service, or delivered to a Heath Authorized Service Center, must be accompanied by the invoice or the sales slip, or a copy of either. If you send the original invoice or sales slip, it will be returned to you.

If it is not convenient to deliver your kit to a Heath Authorized Service Center, please ship it to the factory at Benton Harbor, Michigan and follow the following shipping instructions:

Prepare a letter in duplicate, containing the following information:

- Your name and return address.
- Date of purchase.
- A brief description of the difficulty.
- The invoice or sales slip, or a copy of either.
- Your authorization to ship the repaired unit back to you C.O.D. for the service and shipping charges, plus the cost of parts not covered by the warranty.

Attach the envelope containing one copy of this letter directly to the unit before packaging, so that we do not overlook this important information. Send the second copy of the letter by separate mail to Heath Company, Attention: Service Department, Benton Harbor, Michigan.

Check the equipment to see that all parts and screws are in place. (Do not include wooden cabinets when shipping receivers, tuners, amplifiers, or TV sets, as these are easily damaged in shipment.) Then, wrap the equipment in heavy paper. Place the equipment in a strong carton, and put at least **THREE INCHES** of resilient packing material (shredded paper, excelsior, etc.) on all sides, between the equipment and the carton. Seal the carton with gummed paper tape, and tie it with a strong cord. Ship it by prepaid express, United Parcel Service, or insured parcel post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022

TROUBLESHOOTING CHART

NOTE: The following checks are made with the Radio turned ON and the volume control fully clockwise.

Touch Test Point	Proper Sound	Probable Trouble
TP1	Faint static (Reverse line plug for loudest static)	1. Transistors Q6 and Q7 interchanged, or improperly installed. 2. Transistors Q4 and Q5 interchanged, or improperly installed. 3. Resistors R21, R26, R27, R28, or R29, and capacitor C23 interchanged with other components.
TP2	Moderate static	1. Transistor Q4 incorrectly installed. 2. Resistors R17, R18, R19, R21, R22, or capacitors C20, C21, or C22 interchanged with other components.

Touch Test Point	Proper Sound	Probable Trouble
TP3	Moderate click when touched	1. Diode D1 incorrectly installed. 2. Transformer T2, capacitors C17, C18, C19, resistors R12, R13, R14, or R15 interchanged with other components.
TP4	Click and moderate static	1. Transistor Q3 incorrectly installed. 2. Resistors R12, R13, R14, or capacitors C13, or C15 interchanged with other components.
TP5	Click and faint static	1. Coil L1, transformer T1, capacitor C9, or resistor R9 incorrectly installed or interchanged with other components.
TP6	Loud static or buzz	1. Transistor Q2, resistors R6, R7, R8, R9, R11 or capacitor C6 interchanged with other components.
TP7	Loud static or buzz	1. Transistor Q1, resistors R1, R2, R3, R4, R5, or capacitors C4, C5, or C8 incorrectly installed or interchanged with other components.
TP8	Loud static or buzz	1. Rod antenna L2 open or shorted. 2. Capacitors C1, C2A or C3 shorted. Check for bent or damaged plates, or bits of solder and wire, on the tuning capacitor.

SPECIFICATIONS

Tuning Range.	535 - 1605 kHz.
Intermediate Frequency (IF).	455 kHz.
Sensitivity.	Better than 100 microvolts per meter for 10 dB signal-to-noise ratio or 280 microvolts/meter for 20 dB signal-to-noise ratio.
Audio Output Power.	0.8 watt (800 milliwatts).
Speaker.	3" x 5" oval, 1 oz. permanent magnet, 40 Ω voice coil.
Power Requirements.	105-125 VAC, 60 Hz. Clock only: 2-1/2 watts. Radio and clock: 5-1/2 watts (no power to AC outlet).
Maximum Load at AC Outlet.	10 amperes, 1200 watts maximum.
Dimensions.	Overall, 5-1/2" high x 10" wide x 4-7/8" deep.
Net Weight.	3-1/2 lbs.

The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

CIRCUIT DESCRIPTION

Refer to the Block Diagram (fold-out from Page 32) and the Schematic Diagram (fold-out from Page 39) while reading this Circuit Description.

This Clock Radio is a 7 transistor superhetrodyne receiver which tunes to broadcasting stations from 535 kHz to 1605 kHz. The Radio consists of RF amplifier Q1, oscillator-mixer Q2, IF amplifier Q3, detector D1, audio amplifier Q4, audio driver Q5, and push-pull audio output Q6 and Q7.

RF signals are picked up by rod antenna L2. The desired frequency is selected by the parallel tuned circuit which includes the primary winding of rod antenna L2 and capacitors C1, C2A, and C3. The signal is then coupled through the secondary winding of the rod antenna to the base of RF amplifier transistor Q1. Bias voltage is supplied to Q1 by the voltage divider network of R1, connected to B+, and R2 connected to the AGC (Automatic Gain Control) circuit.

The RF signal is amplified by transistor Q1 and then coupled through capacitor C7 to the base of oscillator-mixer transistor Q2. At Q2 the RF signal is mixed with the oscillator signal. The frequency at which Q2 oscillates is determined by coil L1, capacitor C2B, and capacitor C12, and is always 455 kHz above the incoming RF signal. The amplified RF frequency, the sum and the difference between the RF and oscillator signal, and the oscillator frequency itself, appear at the collector of Q2.

The tuned circuit of T1 passes only the 455 kHz difference frequency. This signal is then coupled from the secondary winding of IF transformer T1 to the base of IF amplifier transistor Q3. Bias voltages for Q3 are developed across the voltage divider network resistors R12, R13, and R14 and are connected to the base of Q3 through the secondary winding of IF transformer T1. C15 neutralizes the collector to base capacity of Q3. Transistor Q3 amplifies the 455 kHz signal which is then fed through IF transformer T2 to detector diode D1.

Detector diode D1 converts the IF signal into a DC voltage and an audio frequency signal. The 455 kc signal is filtered by C17, R15, and C18. The audio signal is filtered again by R2 and C4 which leaves only a DC AGC voltage

that is proportional to the received signal strength.

The AGC voltage is then fed through R2 and the secondary of L2 to the base of Q1 which controls the bias and thus the gain of this stage. The overall effect is to keep the signal at the collector of Q1 and thus the detector output at a constant level.

From the detector, the audio signal is coupled through R15 to the top of Volume control R16. A portion of the audio signal is taken from the variable contact of the Volume control and coupled through capacitor C19 and resistor R18 to the base of transistor Q4. The signal, amplified at Q4, is coupled directly to the base of transistor Q5 where it is further amplified. Then the signal is coupled directly to the base of transistor Q7, and through resistor R27, to the base of Q6.

Push-pull output transistors Q6 and Q7 provide the audio signal with the necessary current amplification to drive the speaker. A positive-going signal applied to the base of Q6 causes this transistor to conduct, charging capacitor C23 through the speaker voice coil. When the audio signal goes negative, Q6 is cut off. This negative-going signal causes Q7 to conduct, discharging C23 back through the speaker voice coil. This charging and discharging of C23 through the voice coil produces the audio signal in the speaker.

Overall negative feedback is provided for the power amplifier by resistors R24 and R25, and by capacitor C21, which are connected from the output circuit to the emitter of transistor Q4.

The AC line voltage is stepped down by power transformer T3 and is rectified by diodes D2 and D3. Capacitor C24 filters the rectified voltage which is supplied to the Radio circuits as a DC voltage. Further filtering for the circuits at Q1, Q2, and Q3 is provided by resistor R23 and capacitors C16 and C17.

The clock motor is wired across the incoming 120 VAC line ahead of the switch. Thus, the switching procedure does not affect the action of the clock, permitting it to run without interruption.

REPLACEMENT PARTS PRICE LIST

To order parts, use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to Replacement Parts in the Kit Builders Guide.

PART No.	PRICE Each	DESCRIPTION
-------------	---------------	-------------

RESISTORS

1-143	.10	2.7 Ω
1-54	.10	15 Ω
1-111	.10	150 Ω
1-45	.10	220 Ω
1-9	.10	1000 Ω
1-144	.10	1800 Ω
1-13	.10	2700 Ω
1-16	.10	4700 Ω
1-20	.10	10 k Ω
1-22	.10	22 k Ω
1-76	.10	33 k Ω
1-121	.10	120 k Ω
1-77	.10	390 k Ω

CAPACITORS

Electrolytic

25-123	.40	2 μ F
25-54	.20	10 μ F, 15V
25-95	.55	10 μ F, 25V
25-145	.50	25 μ F
25-146	.45	100 μ F
25-199	.60	500 μ F

Others

21-111	.10	15 pF disc
21-57	.10	.005 μ F disc
21-47	.10	.01 μ F disc
26-128	2.20	Variable tuning capacitor
27-63	.10	.022 μ F Mylar
27-73	.15	.047 μ F Mylar
28-3	.10	.56 pF phenolic

CONTROL-MOTOR

19-139	1.10	10 k Ω control
406-54	5.00	Clock motor assembly

COILS-TRANSFORMERS

40-676	.65	Oscillator coil
52-90	1.00	IF transformer
40-930	2.25	Rod antenna
52-89	1.30	IF transformer
54-219	2.10	Power transformer

PART No.	PRICE Each	DESCRIPTION
-------------	---------------	-------------

TRANSISTORS-DIODES

417-110	.55	S2090 transistor
417-116	.60	S2091 transistor
417-118	.40	2N3393 transistor
417-201	.50	X29A829 transistor
56-26	.25	1N191 diode
57-29	.40	Silicon diode

HARDWARE

#6 Hardware

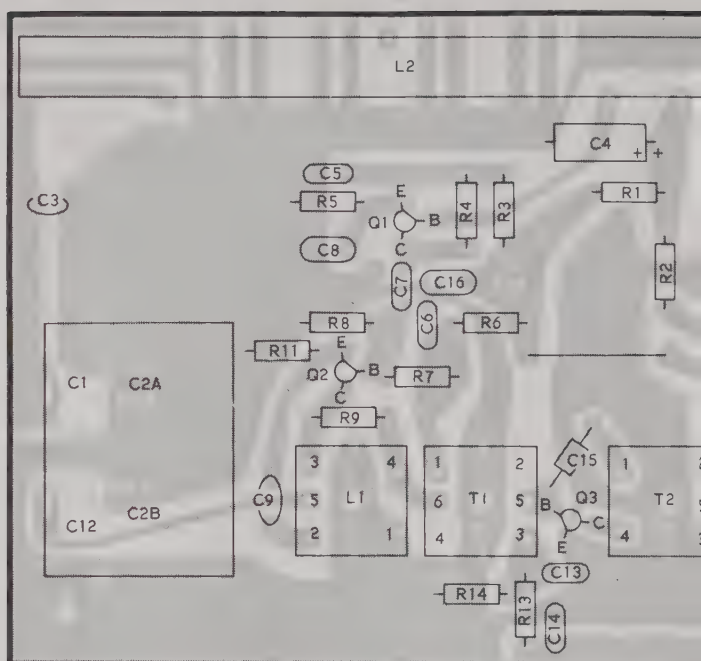
250-56	.05	6-32 x 1/4" screw
250-416	.05	6-32 x 1/4" flat head screw
250-89	.05	6-32 x 3/8" screw
250-276	.05	6-32 x 3/8" flat head screw
250-441	.05	#6 x 3/8" flat head sheet metal screw
250-8	.05	#6 x 3/8" sheet metal screw
250-308	.05	6-32 x 1" flat head screw
252-3	.05	6-32 nut
252-127	.05	6-32 speednut
254-6	.05	#6 external lockwasher
255-103	.10	6-32 threaded spacer

Other Hardware

252-7	.05	Control nut
253-10	.05	Control flat washer
253-11	.05	E washer
254-4	.05	Control lockwasher
255-102	.10	Unthreaded spacer
258-111	.10	Dial cord spring

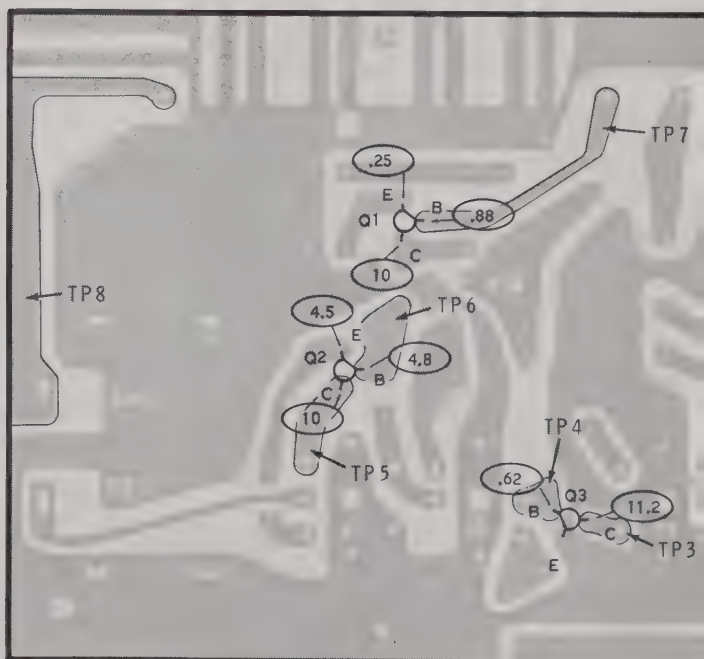
SHAFT-KNOBS-POINTER

453-179	.20	Dial shaft
462-291	.50	Tuning knob
462-294	.60	Function knob
462-309	.65	Volume knob
462-295	.20	Lull-To-Sleep knob
462-297	.40	Clock-set knob
462-310	.25	Snooze knob
463-50	.20	Radio dial pointer
463-55	.55	Set of clock hands



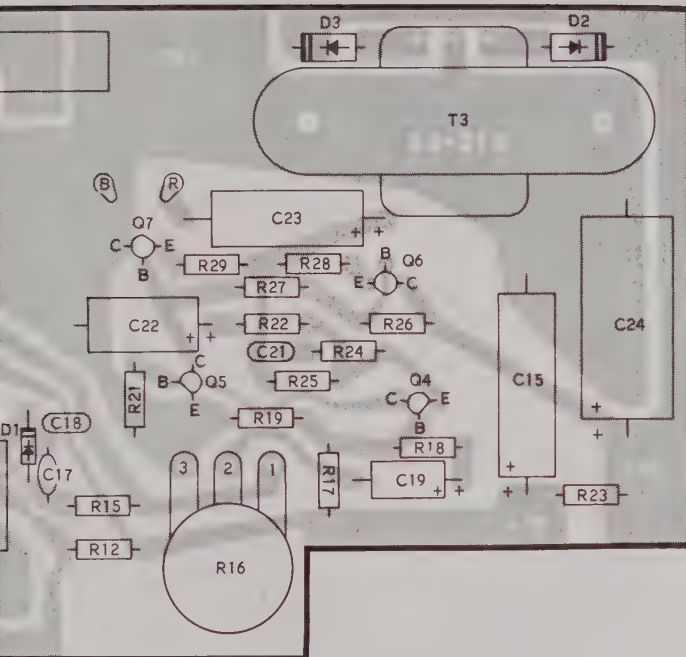
CIRCUIT BOARD

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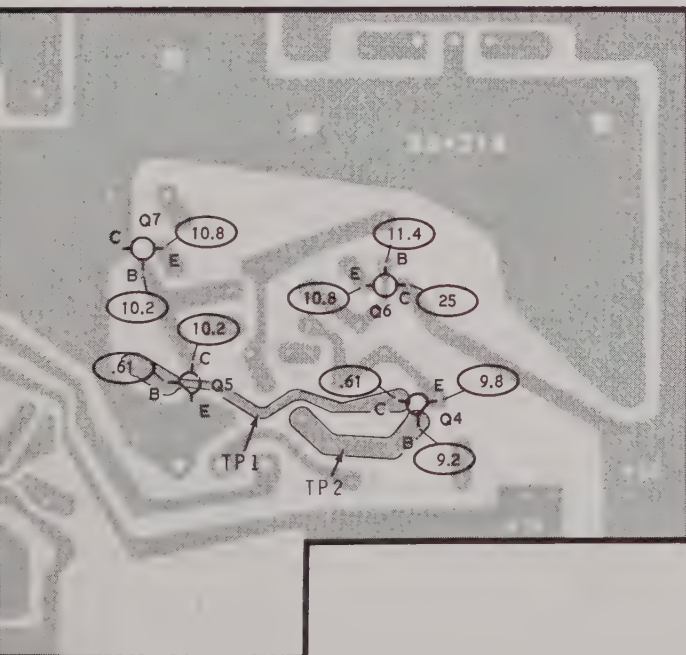
VOLTAGE

(VIEWED FROM)



0 X-RAY VIEW

(FOIL SIDE)



CHART

(FOIL SIDE)

PART No.	PRICE Each	DESCRIPTION
-------------	---------------	-------------

METAL PARTS

200-536	.90	Chassis
100-974	.70	Speaker panel
203-580	.35	Clock panel
204-915	.10	Short U bracket
204-933	.10	L bracket
204-1011	.10	Long U bracket

TERMINAL STRIPS-CONNECTORS SOCKET

431-78	.10	3-lug terminal strip
431-79	.10	4-lug terminal strip
432-66	.10	Connector
434-147	.20	AC socket

WIRE-LINE CORD

344-2	.05/ft	Black stranded wire
344-3	.05/ft	Red stranded wire
344-6	.05/ft	Red solid wire
344-32	.05/ft	Green stranded wire
89-19	.45	Line cord

DIAL PARTS

203-572	2.20	Clock window
446-73	1.00	Dial window
390-243	.10	Light reflector
390-265	1.00	Dial label
390-266	.80	Clock label
100-818	.20	Pulley bracket assembly
455-9	.10	Long bushing
455-38	.10	Short bushing
100-889	.15	Dial cord assembly

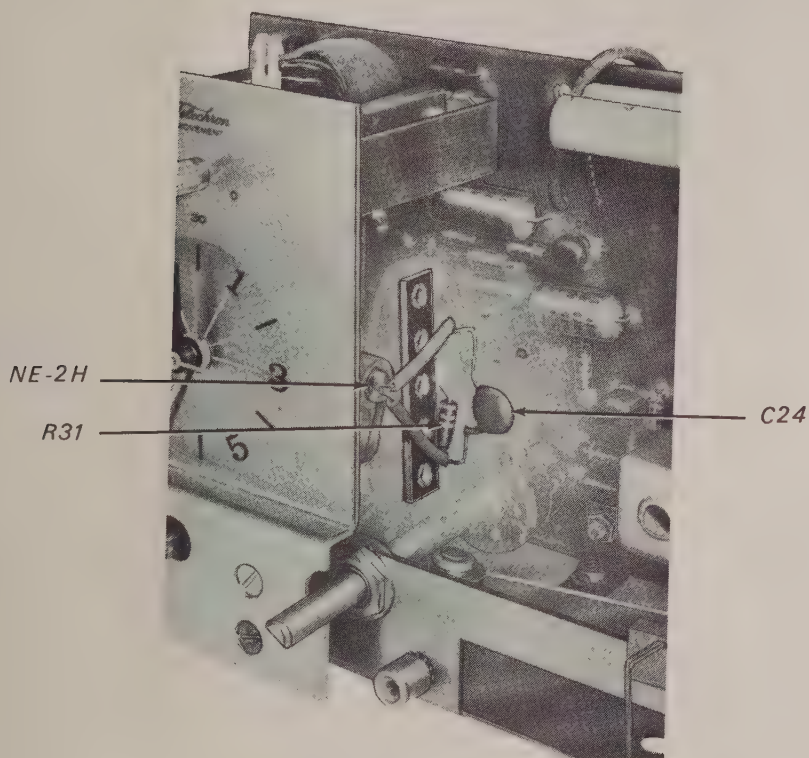
PART No.	PRICE Each	DESCRIPTION
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MISCELLANEOUS

85-314-1	2.90	Circuit board
92-54	2.00	Cabinet
401-129	2.85	Speaker
412-15	.20	Neon lamp
94-436	.30	9-3/4" molding
94-437	.15	3" molding
73-53	.10	Grommet
73-74	.20	Grille gasket
75-30	.10	Line cord strain relief
75-93	.10	1" x 1" paper light shield
207-4	.10	Cable clamp
209-61	.70	Speaker grille
490-1	.10	Alignment tool
490-5	.10	Nut starter
331-6	.15	Solder
	2.00	Manual (See front cover for part number.)

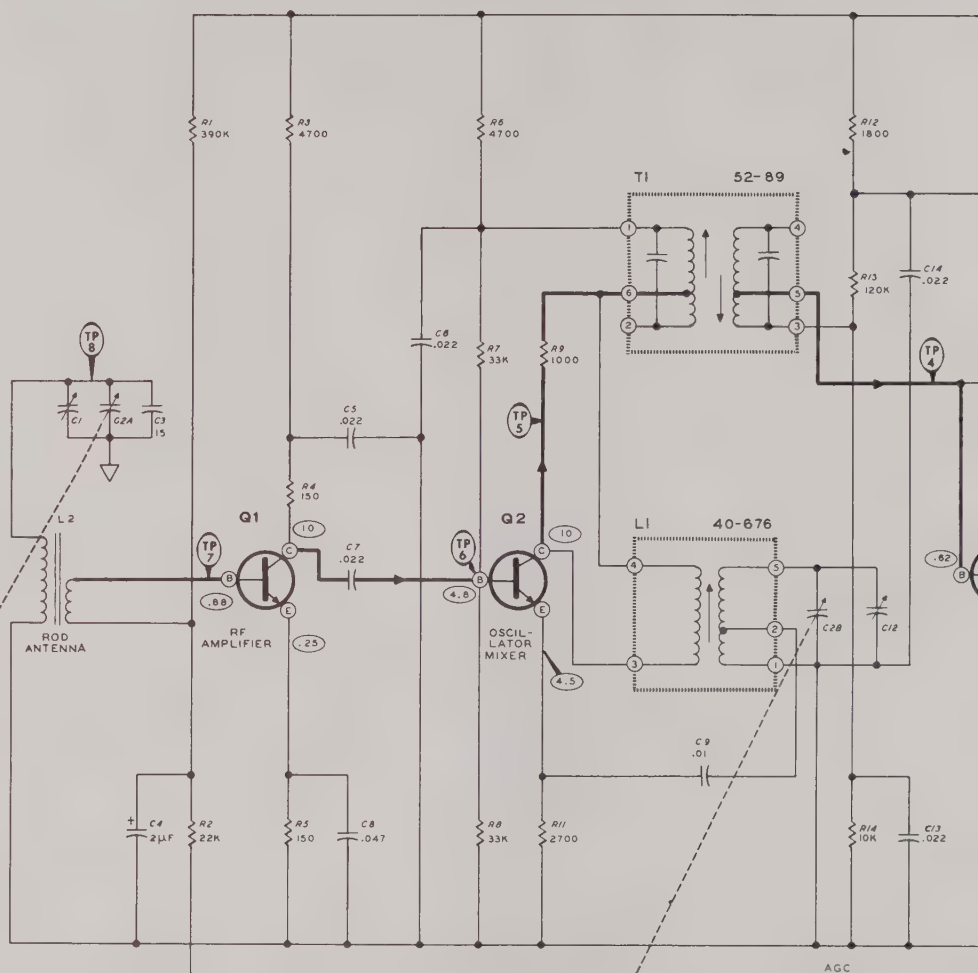
The above prices apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering from an authorized Service Center or Heathkit Electronic Center to cover local sales tax, postage and handling. Outside the U.S.A. parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties and rates of exchange.

CHASSIS PHOTOGRAPH



COMPONENT	HEATH PART NUMBER	MAY BE REPLACED WITH	BASE DIAGRAM (BOTTOM VIEW)
Q1, Q2, Q3, Q5	417-118	G. E. } OR } 2N3393 T. I. }	 
Q4	417-201	G. E. X29A829	
Q6	417-110	FAIRCHILD S2090 (OR, 2N3567)*	
Q7	417-116	FAIRCHILD S2091 (OR, 2N3638)*	
D1	56-26	1N191	
D2, D3	57-29	750mA, 100V	

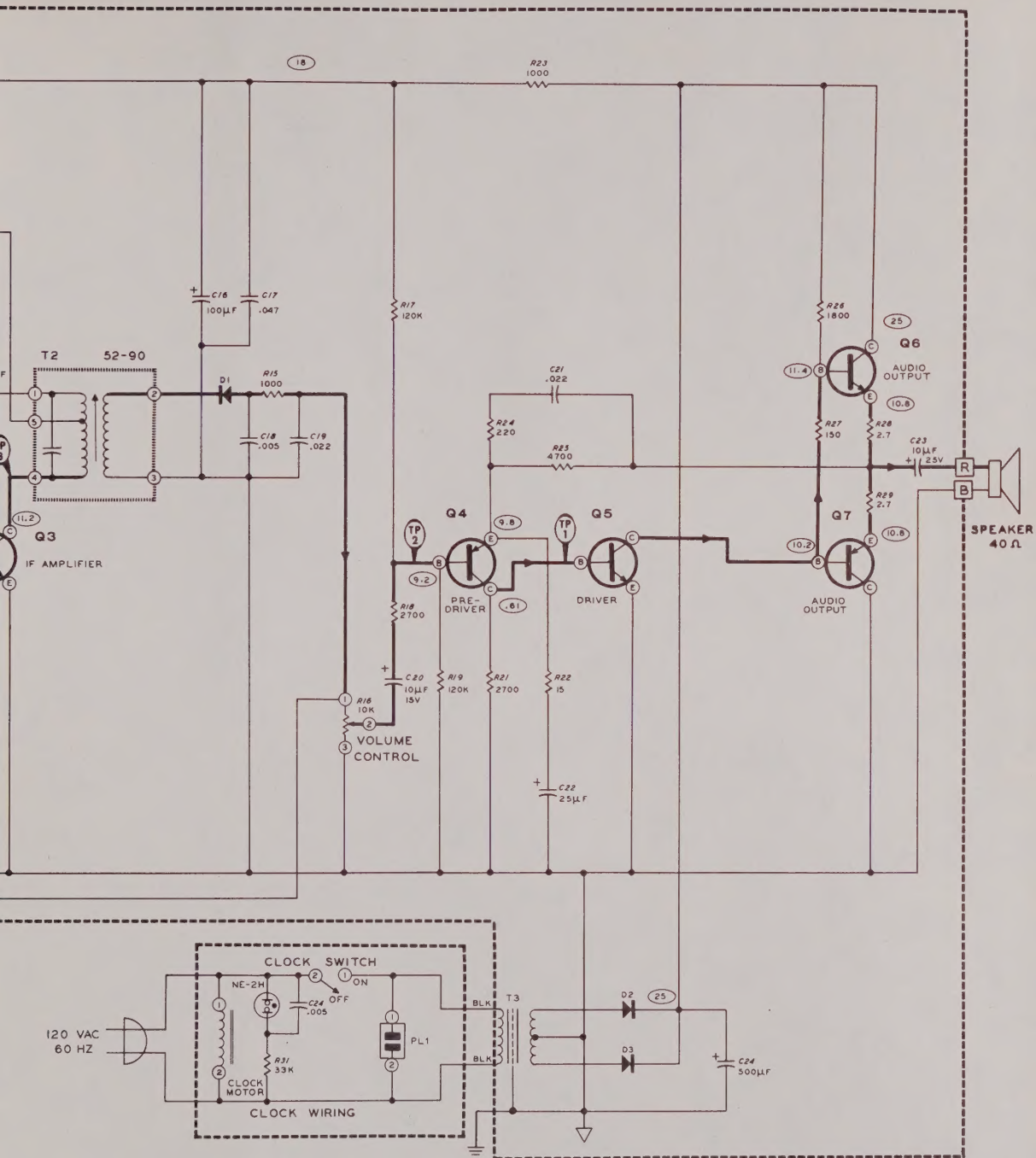
* MAY BE SUBSTITUTED IF OTHER TRANSISTOR IS NOT AVAILABLE



NOTES

1. ALL RESISTOR VALUES ARE IN OHMS; K=1000.
2. ALL RESISTORS ARE 1/2 WATT.
3. ALL CAPACITOR VALUES LESS THAN 1 ARE IN μ F. VALUES OF 1 AND ABOVE ARE IN pF UNLESS MARKED OTHERWISE.
4. THIS SYMBOL INDICATES THE SIGNAL PATH.
5. THIS SYMBOL INDICATES A POSITIVE DC VOLTAGE MEASUREMENT, TAKEN WITH A HIGH IMPEDANCE VOLTMETER FROM THE POINT INDICATED TO CHASSIS GROUND. VOLTAGES MAY VARY AS MUCH AS $\pm 20\%$.
6. THIS SYMBOL INDICATES CIRCUIT BOARD GROUND.
7. THIS SYMBOL INDICATES CHASSIS GROUND.
8. THIS SYMBOL INDICATES TEST POINTS.
9. THIS SYMBOL INDICATES CONNECTIONS TO THE CIRCUIT BOARD.

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MODEL GR-38



HEATH COMPANY

BENTON HARBOR, MICHIGAN



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